Service File

COPY

February 17, 1941.

Mr. C. E. Taylor, Office.

Mill Repairs & Changes--January 1941

January 1. The whole plant was down for 24 hours for New Year's Holiday, from 11:00 PM 12/31/40 to 11:00 PM 1/1/41. Men working were 3 mill watchmen, 3 substation operators, 3 river pumpmen, 3 roaster operators (dead firing), one on each shift. The mine had 3 hoist operators and 6 pumpmen working.

January 7, West mill repairs. Removed 12278 lbs. of minus 2" rods from the 6x12 Marcy and added 44 new 3" rods, 12364 lbs. Inspected the linings and found the feed end head liners to be 3/4" thick and shell liners 1" thick and the discharge end head liners 1-1/2" thick. The feed end trunnion liner was not worn out but will be watched every week, as it is likely to wear through at any time. Inspected the 6x12 drag chain and removed 8 worn out links from the west chain and 7 from the east chain and replaced with spare links that are only half worn out. The Gyrasphere motor was dismantled and cleaned and the ball bearings were cleaned and regreased with Marfak grease. Cleaned out the feed to mill sampler filter pipes and injector to increase flow and suction on filter. Cleaned out #1 and #2 Nash Hytor water separators and float valves (yearly cleaning). Installed a 4" pipe for recirculation of the #1 Pb Dorr Tank spigot product back to the tank during the start up period after every shut down. Inspected #3 Zinc Rougher and found it rotted and in need of rebuilding; the east #3 Zinc Rougher will also have to be rebuilt. Installed a used Dayton Cog Belt on the Gyrasphere crusher drive.

January 8, East mill repairs. Removed 11145 lbs. of minus 2" rods from the 6x12 Marcy and put back 40 new 3" rods, 11240 lbs. Inspected the 6x12 Marcy liners and found the feed end head liners 1-1/4" thick, shell liners 1-1/4" thick and discharge liners 1-1/4" thick. All liners were worn unevenly and at some edges were down to a feather edge. All of these liners fit badly, having too much space between them, which allows them to shift and wear shell and bolts. The feed end trunnion liner was better than the west mill liner. Dismantled the Gyrasphere motor, cleaned the windings and cleaned and greased the ball bearings. (yearly cleaning). Cleaned out the feed to mill sampler filter pipes. Cleaned out #3 and #4 Nash Hytor water separators and float valves (yearly cleanup). Installed a 4" pipe for the recirculation of #1 Pb Dorr Tank spigot product back to the tank when starting the mill after a shut down. Cleaned #3 Marcy mill gears with fuel oil and Varsol and applied a coat of #130A Lubriplate gear grease.

January 14, West mill repairs. Installed a new 18" 4-ply Goodyear "B" conveyor belt on the weightometer conveyor. The belt removed had the whole rubber top cover worn off, but was otherwise in good condition and will be kept uncut as a spare for any mill belt that wears out. The new belt was received a few days

ago; it is our practice now to order conveyor belts only when needed and to install them as soon as received; in the past we have kept belt in our supply sheds under unfavorable conditions for long periods and believe their lives were shortened by this treatment. Mr. Mesloh gives the life and cost data of belts:

"1-W Weightometer Belt: The belt removed January 14, 1941, was installed April 5, 1939. Life in service 21 months 9 days. Total dry tons conveyed 552,505. The belt was manufactured by the U. S. Rubber Company. It was their "Amazon" brand, 18" wide, duck weight 32 ounces, 4-ply, 1/16" top cover and 1/32" bottom cover. The belt cost delivered $175.71. It was purchased on order GB-3307, dated 5/17/38. Cost per ton $.000318025. The life of the belt was shortened, due to the fact that a piece of cable was caught under the skirt. The cable, bearing on the surface of the belt, wore off the top cover, exposing the plies which wore more rapidly.

"The belt installed January 14, 1941, was manufactured by the Goodyear Tire & Rubber Company. It was their Style "B" conveyor brand, 18" wide, 4-ply, 32-ounce duck, 1/16" top cover, 1/32" bottom cover. It was purchased on order AGB-6006, dated 12/17/40. It cost delivered $177.81. The belt was 107' 6-1/4" long as installed."

A template was made of the gear teeth on the 6x12 Marcy to show wear; it appeared that teeth were the same as when measured 6 months ago; no wear. Changed oil in the Philadelphia gear worm reducer (used Pinnacle Mineral Cylinder Oil) and in the Jones Spur Gear reducers (used Nabob machine oil). This is to be done once every year hereafter. Inspected the dust chamber which has not been cleaned out since September 13, 1940. There was 12" to 13" of slime accumulated on the floor; this can reach a depth of 15" or 16" before it will prevent opening of door and then will have to be cleaned out. The 60 HP motor removed from #4 Marcy mill, found defective and repaired at Bluefield, was installed on #2 Marcy mill. It was fitted with grooveless bearings made the same as those installed in #4 Marcy motor which have been running cool since they were first installed. The motor removed from #2 Marcy had insulation burned off the lead wires from overheating at some time in its life. The Hardinge mill was shut down to examine the lining and 2 small holes (2" to 3" diameter) were found near the door. New casings and impeller were installed in the Hardinge discharge pump. The Hardinge motor was shifted to make the drive belt run in the center of the pulley.

January 15, East mill repairs. Changed the pinion and pinion shaft on #3 Marcy mill; the pinion removed was loose on its shaft. Installed a worm pinion and alloy steel pinion shaft. Cleaned the gears on #4 Marcy with fuel oil and Varsol and applied a coat of #130A Lubriplate. All 4x10 Marcy gears now have Lubriplate gear grease in them. Made a template of gear teeth on #3

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Marcy, which has a comparatively new large gear, so the wear on teeth lubricated with Lubriplate can be measured or noted and the desirability of continuing the use of this form of grease be determined. Made a template of gear teeth on the 6x12 Marcy showing wear with Crater XX gear grease (templates made every 6 months starting about a year after their installation, when the use of Crater was started after severe wear was noted, wear due to unsatisfactory lubricant and water and muck ground into the gear teeth). Installed new Flex-O-Tubes in the oil lines to the Gyrasphere crusher replacing those that leaked. Lined the rotating center of the Pb Dorr Bowl Classifier with 1/4" manganese steel plate. Changed oil in all Philadelphia Gear Reducers and in all Jones Speed Reducers (yearly). Removed one link from each chain of the 6x12 drag classifier.

The oil temperature in the west Gyrasphere rose to 250° at 4:00 AM and a fuse was blown. This was caused by setting up the crusher too close. We have adopted the practice of setting up once each week on repair days and it is sometimes difficult to fix on the right number of lugs to produce grinding sufficiently fine without increasing the power to the danger point. When fines are not removed from the feed to these crushers they will choke if set too close; choke feeding is possible when fines are screened out ahead of the crusher.

January 21, West mill repairs. Changed motor on #1 Marcy mill; removed old one for cleaning and reconditioning and put on the reconditioned motor removed last week from #2 Marcy.

January 22, East mill repairs. Installed a new set of flights at the lower end of the west rakes of the Duplex Classifier. Installed a reconditioned pinion shaft on #3 Marcy replacing one installed last week the teeth of which do not match the big gear teeth satisfactorily. The big gear is a comparatively new one with teeth only slightly worn so it is desirable to have a pinion with unworn gear teeth surfaces engaging it. The pinion installed, though the teeth are badly worn on one side, has one side of teeth as good as new; the pinion was placed so the good sides of teeth engage the big gear teeth.

January 28, West mill repairs. While making weekly adjustments and repairs the west Nash Hytor motor was shut down and #2 Nash was disconnected from the motor so that when the mill was again started there were only 3 Nashes in operation. This was done to save power and the waste of compressed air also to determine if possible to run with 3 Nashes so that when the spare Nash motor is reinstalled under the west Pb cells the 175 HP Nash motors may be shut down one at a time for cleaning and repairs. When the mill was started with 3 Nashes the air pressure was 7 lbs. and no air escaped through the blow off valve in the compressor room. In cold weather it is possible to run with 3 Nashes when cells are operated as at present (#1 Zn Rougher both sides are run with just enough air to keep muck moving through the cell and with no froth overflow; 3 bottoms in the head end of the East and West Pb Roughers are operated with no froth overflow).

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The Hardinge mill was shut down to inspect the lining. The Hardinge gears were cleaned with Varsol and a coat of #130A Lubriplate was applied. The gears will be greased every 4 hours. Micrometer measurements of the pinion gear teeth will be taken at 2-weeks intervals for the observation of wear while using this new grease. Lubriplate is used on all 4x10 Marcys. Crater Compound is used on the 6x12 Marcy gears only.

While the mill was down for repairs one link was removed from each chain of the 6x12 drag classifier, leaving 274 links with an average pitch of 4.315".

January 29, East mill repairs. Changed oil in the Telsmith crusher (1975 hours), cleaned pipes and tank. Changed oil in the Gyrasphere crusher. Installed 3 new oversize head sprockets and a new 3-15/16" diameter head shaft on the 6x12 drag classifier. The sprockets were made here from 1" steel plate and castings from Palmerton. The pitch of the teeth was 4.18" (standard pitch 4.063"). When started the chain hugged the root of the teeth and did not climb or slip as it had been doing on the standard pitch sprockets. It is now evident that it will now be possible to reinstall discarded #124 manganese steel chain on all drags for further wear; this advance is made possible by the use of traction wheels in place of tail sprockets, upper chain supports and overpitch head sprockets. The head sprockets removed were worn out and were loose on the square head shaft. The present #124 manganese steel chain has already had a longer life than any previous chain operated under the same conditions and will have an additional estimated life of 6 months (till August 1, 1941). Mr. Mesloh gives here the life and cost data of the head sprockets removed and installed at this time.

"<u>Head Sprockets:</u> 3 used manganese steel head sprockets, 28 teeth, mounted on a 4" square used shaft, were installed January 4, 1940. They were removed January 29, 1941. Life in service 12 months 25 days. Dry tons conveyed 317,854. The cost and previous life of the sprockets is unknown, therefore the cost per dry ton conveyed cannot be calculated.

"The head sprockets, installed January 29, 1941, were made at Austinville. They were made with cast iron hubs and cast iron rim segments with a steel plate center. The rim segments are demountable so future sprockets will only need rims.

"The first cost of 3 of these sprockets is estimated to be $432.86. When these sprockets are renewed the estimated cost for 3 will be $79.59. Cost details are given below.

"The advantage of making our own sprockets is that the rims can be changed to accommodate the increased pitch length of the chains, due to wear, thus increasing the life of the chains from 75% to 150%.

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"3 oversize head sprockets were made at Austinville, pitch of teeth 4.18". The sprockets were made with removable rims of cast iron, solid steel plate center, and cast iron hubs.

"The cost of the 3 sprockets mounted on a shaft is as follows:

Nov 1940	Supplies, 1" Plate		$ 26.46
	Truck Expense		.78
Dec 1940	Labor $16.20, Shop Burden $4.11		20.31
Jan 1941	" 212.89 " " 64.35		277.24
	Supplies, Steel Shaft 3-15/16" diameter (round)	$25.35	
	Coupling Halves	26.36	
	Rim Segments (includes $14.30 pattern cost)	38.90	
	72 Hex Nuts	5.62	
	24 Machine Bolts	1.12	
	12 Set Screws	.52	
	40' Chrome Molybdenum Steel 7/8" diameter	10.20	108.07
TOTAL COST OF 3 SPROCKETS			$432.86

"These sprockets can be renewed by putting on new rims. The cost of the second set of sprockets will be for rims only, the cost of the castings and machining estimated as follows:

Machining $42.30, plus $12.69 Shop Burden	$ 54.99
Castings from Palmerton $38.90, less $14.30 pattern cost	24.60
	$ 79.59"

Installed a reconditioned motor on #3 Marcy mill, replacing the light capacity 60 HP Wagner spare motor which has been on this mill for the past month while overhauling all of the 4x10 Marcy motors. The rod charge was increased 2000 lbs. above the weekly addition to restore power consumption to 78 HP (it has been held at 70 HP while the light motor was driving it).

WEIGHTOMETER TESTS

	West		East
1/7/41	.33% High	1/8/41	.77% High
14	.29% Low	15	.70% Low
21	.80% Low	22	.51% Low
28	.40% High	29	.89% High

Average screen analyses, feed to flotation:

East Unit: 3.6% on 48-mesh; 11.9% on 65-mesh; 23.5% on 100-mesh; 52.7% on 200-mesh; all cumulative.

West Unit: 3.3% on 48-mesh; 13.4% on 65-mesh; 25.6% on 100-mesh; 54.0% on 200-mesh; all cumulative.

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POWER FOR GRINDING----KWH PER TON

	West	East	Total
Dry Tons Crushed	26042.7	25986.8	52029.5
Telsmiths	.256	.220	.238
Gyraspheres	.726	.712	.719
6x12 Marcys	3.291	3.333	3.312
Hardinge Mill	1.032	1.034	1.033
4x10 Marcys	3.578	3.390	3.484
TOTAL	8.883	8.689	8.786

WATER FOR FLOTATION

	Average	Maximum	Minimum
Turbidity	18	29	8
pH	7.4	7.4	7.3
Temperature, F.	53	58	51

Total rainfall 1.08". Maximum .28" on 1/3/41.

TIME LOST FOR REPAIRS---BASED ON TELSMITH RUNNING TIME

East Unit:

1/1/41 24 Hours, New Year's Holiday.
2 35 Minutes, Starting up after holiday.
4 15 " Feed chute choked.
6 15 " Out of ore.
8 4 Hours 50 Minutes, General repairs.
15 4 " 50 " " "
20 15 Minutes, Wet ore, chute under Telsmith choked.
22 4 Hours 55 Minutes, General repairs.
27 10 Minutes, Out of ore, part feed 1 hour 5 min digging ore down in bin.
29 5 Hours, General repairs.
30 10 Minutes, Tightening oil line on Gyrasphere.
31 10 " Chute under Telsmith choked.

West Unit:

1/1/41 24 Hours, New Year's Holiday.
2 1 Hour 10 Minutes, Starting up after holiday. Trouble with 6x12 drag switch.
5 5 Minutes, Feed chute choked.
7 5 Hours 55 Minutes, General repairs 5 hrs 40 min, 4x10 Marcys overloaded 15 min.
14 4 Hours 55 Minutes, General repairs.
15 2 " 15 " Fuse blown on Gyrasphere. Crusher choked & oil temperature too high. 6x12 Marcy down a total of 3 hrs light feed.
16 5 Minutes, Gyrasphere crusher oil temperature too high; cut feed down & turned oil through radiator. 6x12 by-passed 50 min tightening shell liner bolts.

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1/17/41	6x12 Marcy down 1 hour tightening shell liner bolts.
20	5 Minutes, 4x10 Marcy overloaded. 6x12 Marcy by-passed 10 min tightening shell liner bolts.
21	4 Hours 30 Minutes, General repairs. 6x12 Marcy by-passed 40 min for repairs in addition to time shown.
28	4 Hours 30 Minutes, General repairs.
29	15 Minutes, Telsmith crusher choked under bottom.

Hardinge Mill:

1/1/41	24 Hours, New Year's Holiday.
2	35 Minutes, Starting up after holiday.
14	2 Hours 50 Minutes, Inspecting lining & repairing discharge pump.
17	Pumping dam 1 Hour 45 Minutes, no initial feed.
28	6 Hours 15 Minutes, Inspecting lining & applying Lubriplate to gears.

(Signed) L. J. Weintz

LJWeintz/ESS

1-W drag classifier chain 2-14-41

*4124 Pintle Doog Classifier Chain The drag classifier chain removed 2-14-41 was installed 7-27-40. Life 6 mo. 17 days. Dry Tons conveyed 158,445. This chain had seen previous service of 5 mo 17 days in which 149,375 dry tons were conveyed. When removed 2-14-40, after the first period of service, the chain was re-equipped with a new set of pins costing #110. (pins only) Installations cost not included. The original cost of the chain was #353.33.

Total life of chain 12 mo 4 days. Total cost of chain #463.33. Total dry tons conveyed 307,870. Cost per dry ton conveyed #.001505. The life of this chain was prolonged 4 mo 6 days by installing oversize pitch sprocket Oct 8, 1940. This chain has the best record to date for cost per ton conveyed since lengthing the drag classifier

The drag classifier chain installed 2-14-41 was made up of 286 plain and 286 attachment links. The chain was removed from the 1-W Unit 7-27-40. It had to be removed as it was jumping the teeth on the head sprocket. Previous life 6 mo 13 days; cost #355.86; dry tons conveyed 169,339.

K.M.

2/20/41

No 4½ Champion Crusher

The crusher was inspected on ~~the~~ Feb. 20, 1941. and ~~the~~ following parts could not be located.

			Cost/Part Unit
1 Part	39.	Toggle Seat Liner.	.25
1 Part	40	Toggle Seat	8.50
1 Parts	55	Oil Cups Lid Clamps	1.15
1 Part	64	Tumbler oil cups lid.	1.35
1 Part	32	Tumbler arbor { carbon steel	27.50
	25	{ or manganese steel	38.00
2 Parts	25	Roller Bearings 5.65 ea	11.30
2 Parts	74	Roller Bearing cage bolt ¾ × 7¾ slotted nut	.65
2 Parts	47	Arbor nut with bolt (old cage split) 4.65 ea	= 9.30
4 Parts	58	Arbor nut bolts 15¢ ea	.60
1 Part	28	Tension Rod Spring	1.50
1 Part	41	Tension Rod Spring Washer	.50
2 Parts	48	Arbor Flange Pins 25¢ ea	.50
			$ 63.10

The new jaw plates noted in letter of Feb 1-1941 cannot be located.

Km.

Service File

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March 27, 1941

Mr. C. E. Taylor, Office.

Mill Repairs & Changes--February 1941

February 1. Experiments were made with different emulsified asphalt and cement mixtures to find a suitable material for filling the cracks between the 6x12 Marcy mill shell liners and head liners. None were satisfactory, as they took too long to set up and did not appear to be sufficiently resistant to abrasion. A mixture of hot high melting point asphalt and minus 1/2" plus 1/4" rock was tried and appeared to have the necessary elasticity and strength to resist shock and abrasion. #16 Apkote liquid asphalt was used as a primer before filling the test piece with the hot asphalt and rock mixture. New type 6x12 Marcy shell liners have been made, at our request, so all cracks are wider at the bottom (wedge-shape) and will hold material calked or poured into the crack. Hot asphalt will be tried in the cracks when the mills are relined and if it comes out the cracks will be calked with oakum which will stay in place to protect the shell even though it has not sufficient strength to keep the liners from shifting as they have done in the past.

February 4, West mill repairs. In an effort to stop oil waste and contamination of ore a thorough clean up was made around the Telsmith and Gyrasphere crushers and around the 4x10 Marcys so that leaks in pipe lines, etc., may be detected. Drain pipes were installed from the 4x10 Marcy bearing bases to containers on the floor. Removed one link from each chain of the 6x12 drag classifier, leaving 273 links with an average pitch of 4.331". The links removed were badly worn and appeared likely to break at any time, but it has been decided to run the chain till it breaks in order to determine the maximum life.

February 5, East mill repairs. Cleaned up oil and stopped leaks around Telsmith and Gyrasphere crushers and 4x10 Marcys. Made measuring devices to measure the wear on 4x10 Marcy gear teeth, 6x12 Marcy gear teeth and Hardinge mill gear teeth to determine comparative wear when Lubriplate and Crater gear greases are used. Lubriplate is cleaner to handle, but we have the impression that there is a slight increase in wear of gear teeth since starting to use it.

February 9, Mine crusher repairs. Changed oil in speed reducer, removed 32 gallons #629 oil and put in 40 gallons #629 oil. Washed out the water jackets, tightened the plugs in water jackets which were leaking. Installed a jack screw in place of one found broken. Measured wear on jaw pin and bushings, 1/32".

February 11, West mill repairs. Shut the Hardinge down for inspection and to stop oil leaks from bearings to floor. Changed froth pipes from the long lead rougher to make flow to #1

Pb pump more direct to prevent surging of the pump.

February 12, East mill repairs. Removed the key from the east head sprocket on the 6x12 drag and made an offset key to make the teeth of this sprocket line up with the teeth of the other 2 head sprockets (teeth were 1/2" out of line before this change and only one sprocket was pulling the chain). Installed a new long lifting rod in the east side of the Duplex Classifier, replacing one that was welded together a few nights ago. Removed one split Dayton Cog Belt from the 6x12 Marcy drive and installed a spare used belt.

February 13, Nash Hytor changes. Installed the 60 HP reconditioned motor on the spare Nash Hytor under the west lead cells. The spare Nash was then started and at the same time the west Nash motor driving #1 and #2 Nash Hytors was shut down. The air pressure with the spare Nash and the 2 east Nashes running dropped from 7 lbs. to 6-3/4 lbs., but was considered adequate, thus releasing the west Nash motor for overhauling and cleaning which it needs badly. The spare Nash was driven by a 15" motor pulley and 48" driven pulley at a speed of 269 RPM and power was 63.6 HP. A 15-5/8" pulley was available and was installed, raising the power to 68-69 HP and providing a small corresponding increase in air produced. Repairs on the west Nash motor (175 HP) were started.

February 14, West 6x12 drag chain broken. The chain broke at 4:45 AM and piled up at the head end before the motor could be stopped. The chain was completely worn out. One link in each chain was broken; both broke through the eyes and many other links were worn to the point where they would have broken in the next few days. The pins which were new when the chain was started in July 1940 were worn badly, but had ample strength for several months longer life. It is now questionable if the use of new pins in a worn chain is justified; this point will be proved by the performance of the present chain, which has worn links and equally worn pins at the start. New pins shorten the pitch length, but this can be accomplished more economically by increasing the pitch of sprocket teeth. The chain was cut apart with the acetylene torch and was removed. There were 273 links in each strand with an average pitch of 4.331". The head sprockets were in good condition and were of the correct pitch for the chain about to be put on, so were left in place. The pitch of sprocket teeth is 4.18". All idlers for supporting the top chain and the tail traction wheels were in good condition and were left in place. The flights were worn to 3-1/8" depth (originally 4"), but were considered good for further service so were cut off the old chain and were bolted on the chain put in service. The chain installed was the second #4124 pintle chain to be purchased; it was put in service in January 1940 and was removed July 27, 1940, because it had started to jump teeth on the standard pitch head sprockets which were then in service. The chain was made up of 286 alternate plain and attachment links in each of the 2 strands. The average pitch was calculated to be 4.134" which is the same as the chain broken today was when it was installed on July 27, 1940. The life of the present chain should

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therefore be the same as the one removed (about 6 months; it may however be longer when still longer pitch head sprockets are installed when the chain wears to a longer pitch and starts riding high on the teeth and slipping; long pitch sprockets eliminate slippage). Repairs were completed and the chain was ready to run again at 12:45 PM. Eight hours is probably the shortest time in our experience replacing a worn out drag (formerly head and tail sprockets were wrecked and had to be replaced). Mr. Mesloh gives below the life and cost data of the chains removed and of those installed on this day:

"#4124 Pintle Drag Classifier Chain: The drag classifier chain removed 2/14/41 was installed 7/27/40. Life 6 months 17 days. Dry tons conveyed 158,445. This chain had seen previous service of 5 months 17 days, in which 149,375 dry tons were conveyed. When removed 1/14/40, after the first period of service, the chain was re-equipped with a new set of pins costing $110.00 (pins only). Installation cost not included. The original cost of the chain was $353.33.

"Total life of chain 12 months 4 days. Total cost of chain $463.33. Total dry tons conveyed 307,820. Cost per dry ton conveyed $.0015052. The life of this chain was prolonged 4 months 6 days by installing oversize pitch sprockets 10/8/40. This chain has the best record to date for cost per ton conveyed since lengthening the drag classifier.

"The drag classifier chain installed 2/14/41 was made up of 286 plain and 286 attachment links. The chain was removed from the 1-W unit 7/27/40. It had to be removed, as it was jumping the teeth on the head sprocket. Previous life 6 months 13 days; cost $355.86; dry tons conveyed 169,339."

The west 175 HP Nash Hytor motor was dismantled and removed to the electric shop for repairs, varnishing and painting. Air pressure with the 2 east Nashes and the spare Nash under the lead cells operating was 9 lbs. This was reduced to 7 lbs. by wasting some air in order to lower the power on the spare Nash motor from 76 HP to 70 HP. No. 1 Nash Hytor was dismantled for cleaning and inspection. Clearance between the rotor and housing was .010". There were 6 thicknesses of paper each .009" in the gasket. When the Nash was reassembled on February 18 the gasket was made up of 6 pieces of paper of varying thickness, total thickness .0525". On February 20 when the machine was tried by hand this setting was found to be too close, so another paper .0045" was added to allow the rotor to turn freely. The motor bearings were measured and found to be .007" to .008" larger than the shaft diameter. They are exceptionally long bearings (14") and tapered on the outside so would be difficult to chuck and rebore straight in our worn lathes. Since the bearings were only .002" to .003" larger than a new bearing should be (shaft 5" diameter) it was decided to put them back without rebabbitting them. On February 22 the reconditione

motor was connected to No. 1 Nash and after a few minutes run it was shut down because of high power. The clearance was too small and the rotor had galled the housing---nothing serious, but it was necessary to clean it up again and to put in a new gasket to give it more clearance. The gasket was made of 5 pieces of drawing paper each .008", 1 car lining paper .015" and 1 wrapping paper .0045", total thickness of gasket .0595". We were out of 54" manila drawing paper from which we make these gaskets, so had to use other paper which is too soft for the purpose. A supply of drawing paper has been ordered to have on hand for this purpose. The coupling faces between No. 1 Nash and the motor were rubbing, whereas they should have about 1/8" clearance; this tended to move the rotor against the housing. To correct this condition the 1" diameter foundation bolts on the Nash were turned 1/8" smaller in diameter to allow room in the Nash base casting holes to move it away from the motor. After these changes the machine ran without further trouble.

February 18, West mill repairs. Installed a pipe and valve for recirculation of #1 Zn Dorr Tank spigot product while the mill is down for repairs and after each holiday shutdown. Recirculation keeps the tank in running condition at repair time and restores it to running condition after a long shut down, thus shortening the start up time. It also provides normal feed with respect to percentage of coarse and fine muck and results in better work in the cells.

February 19, East mill repairs. Installed a reconditioned oil pump on the Telsmith crusher to stop oil leaks. Installed a pipe and valve for recirculation of spigot product of #1 Zn Dorr Tank, to be used at shut down times.

February 20. Installed 2 used Dayton Cog Belts on #1 Marcy drive replacing 2 broken belts. There is now only one used belt of this size left, so an order was placed today for a set of matched belts for the 4x10 Marcys.

February 25, West mill repairs. Shut the Hardinge down for inspection. The gear teeth seem to show a slight increase in wear since Lubriplate was put on. It was decided to change back to Crater Compound on these gears. Started dismantling the east Nash Hytor motor for cleaning and repairs. The check valve in 10" discharge line did not hold, so it was necessary to blank off the pipe to maintain mill air pressure. The check was later rebuilt to hold air pressure; all checks now hold.

February 26, East mill repairs. Removed one link from each chain of the 6x12 drag classifier, leaving 284 links with an average pitch of 4.1915" in each chain. There are 141 flights spaced 8" centers. The head sprockets are oversize 4.18" pitch. The chain at present is a perfect fit on the sprockets.

February 28. The feed screw on #3 Marcy was removed because of a broken flight. It had been in service since 5/9/40

and Ni-Hard flights were only slightly worn. The shaft was a standard 3-7/16" diameter with ends turned to 2-15/16" bearing. The one installed was also a standard with Ni-Hard flights. The rubber bearings installed 5/9/40 showed no wear and barring accidents will last indefinitely (babbitted bearings formerly lasted only 2 to 3 months).

WEIGHTOMETER TESTS

West		East	
2/4/41	OK	2/5/41	.30% high
11	.44% low	12	.22% "
18	.56% high	19	.47% "
25	.54% low	26	OK

Average screen analyses, feed to flotation:

East Unit: 3.3% on 48-mesh; 11.4% on 65-mesh; 23.1% on 100-mesh; 51.8% on 200-mesh; all cumulative.

West Unit: 3.4% on 48-mesh; 12.8% on 65-mesh; 25.0% on 100-mesh; 53.3% on 200-mesh; all cumulative.

POWER FOR GRINDING---KWH PER TON

	West	East	Total
Dry Tons Crushed	24170.4	24402.3	48572.7
Telsmiths	.249	.216	.232
Gyraspheres	.655	.653	.654
6x12 Marcys	3.281	3.319	3.300
Hardinge Mill	1.041	1.031	1.036
4x10 Marcys	3.502	3.467	3.485
TOTAL	8.728	8.686	8.707

WATER FOR FLOTATION

	Average	Maximum	Minimum
Turbidity	16	30	8
pH	7.3	7.8	7.3
Temperature, F.	52	55	50

Total rainfall .81". Maximum .52" on 2/14/41, approximately 1-1/2" snow.

TIME LOST FOR REPAIRS--BASED ON TELSMITH RUNNING TIME

East Unit:

2/3/41 5 Minutes, 4x10 overloaded. 6x12 Marcy by-passed 1 hr 15 min dipper lip loose.

Mr. C. E. Taylor---Mill Repairs & Changes---Feb. 1941.

2/5/41	4 Hours 5 Minutes, General repairs.
7	5 Minutes, Power interruption, Telsmith choked.
8	5 " Feed chute choked.
12	5 Hours 40 Minutes, General repairs.
19	4 " 5 " " "
21	20 Minutes, Tightening set collar in sprocket shaft head of 6x12 drag.
26	4 Hours 20 Minutes, General repairs.
28	#3 Marcy by-passed 2 hours 40 minutes flight broken on feed screw.

West Unit:

2/4/41	4 Hours 40 Minutes, General repairs 4 hrs 35 min. Feed chute choked at Gyrasphere crusher.
10	5 Minutes, Chute to #2 Marcy choked.
11	6 Hours 55 Minutes, Stopping leak in 6x12 elevator wheel 5 min, general repairs 6 hrs 50 min.
13	6x12 Marcy by-passed 15 min tightening shell liner bolts.
14	8 Hours, 6x12 drag classifier chain worn out & broken. Installed spare chains.
18	4 Hours 5 Minutes, General repairs.
20	#1 Marcy by-passed 50 minutes installing 2 spare Dayton Cog Belts.
25	3 Hours 35 Minutes, General repairs.
26	1 " 30 " Blanking air line to #3 Nash Hytor for check valve repairs.

Hardinge Mill:

2/3/41	50 Minutes, Inspection of gears.
11	1 Hour 45 Minutes, Inspection of lining.
16	Initial feed off 2 hours 45 minutes, pumping dam.
25	2 Hours 20 Minutes, Inspecting lining & gears.
26	1 " 30 " Blanking air line to #3 Nash Hytor.

(Signed) L. J. Weintz

LJWeintz/ESS

Service Lab

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April 29, 1941.

Mr. C. E. Taylor, Office.

Mill Repairs & Changes---March 1941

March 4, West mill repairs. Changed oil in Telsmith crusher, installed spare oil tank with soldered joints to stop oil leaks. Changed oil in Gyrasphere crusher. Changed oil in 6x12 drag speed reducers (3 months). The bottom of the feed box leading to the zinc Dorr Bowl was rebuilt as it was worn out. Removed one link from each chain of the 6x12 drag leaving 285 links with an average pitch of 4.148".

March 5, East mill repairs. Changed oil in the 6x12 drag speed reducer (3 months), spent oil was sent into the mine to be used on mine crusher toggles. Repaired the concrete partition between #3 and #4 Marcy feed screws by bolting on plates and filling in back of plates with hot asphalt.

March 11, West mill repairs. Inspected 6x12 Marcy feed end trunnion liner which is about worn out, but reported it good for another 30 days. Removed the Telsmith countershaft to inspect bronze bearings and found them in perfect condition after 1-1/2 years of service. Installed Flex-O-Tube pipes in oil line to suppress vibration. Removed one link from each chain of the 6x12 drag classifier, leaving 284 links with an average pitch of 4.163". Shut the Hardinge down to inspect the lining and found it OK. One 3" hole near the door. Cleaned all Lubriplate off the Hardinge gears with Varsol and applied Crater Compound XX gear grease which seems to cause less wear of teeth. Installed a rebuilt 10" check valve in the discharge line of #3 Nash Hytor. It has a 6-11/16" orifice and a rubber seat made of 1/8" #1045 rubber. All 5 Nash check valves are now tight.

March 12, East mill repairs. Changed oil in the Gyrasphere crusher. Installed Flex-O-Tubes in Telsmith oil lines to suppress vibration. Welded ends of 6x12 drag flights where broken off and straightened others. Looked for the cause of broken flights and found a 2x4 wood strip near the tail end and cut it off.

March 14. The east Nash Hytor motor was replaced after cleaning and varnishing windings. All starting equipment was overhauled. The water separators were cleaned and float valve mechanisms were overhauled. The motor bearings were not rebabbitted.

March 15, Mine crusher repairs. Installed reconditioned toggles and toggle bearings. When finished the crusher was set at 3-3/4" opening with jaws closed and had 3" of shims for this setting. The left hand stationary jaw plate was found to be cracked at core for eye bolt. Before changing parts the pitman hung 9/16" out of plumb in 18" toward the jaws. After the change it hung 3/16" in 18" out of plumb away from the jaws. The safety toggle was a used one with faces machined true and measured 24-1/2" out to out. The long

toggle had new chrome nickel steel cast toggle ends rivetted on with countersunk head rivets and measured 36-3/4" out to out. The 4 toggle bearings were used ones and were ground to fit the toggles. The jaw plates were worn flat at the bottom, but will last 3 or 4 months longer before reversing. Toe lugs were OK. The pitman springs were unbroken but one tension rod spring and one tension rod were found broken and were replaced. Mr. Mesloh gives cost and life data.

"Safety Toggle: The 25" safety toggle, removed 3/15/41, was installed 10/8/39; life 17 months 7 days. Dry tons crushed 913,134. Cost per dry ton crushed $.00010817. The toggle was purchased on order AGB-3264, dated 8/10/39. It cost delivered $98.77. The toggle weighed 664 pounds new as per invoice.

"The safety toggle installed 3/15/41. It was 24-1/2" long. It was an old toggle, reconditioned by grinding the ends.

"Solid Toggle: The solid toggle, removed 3/15/41, was installed 10/8/39; life 17 months 7 days. It was 36" long. It had renewable ends, purchased on order GB-9159, dated 9/18/36. The two ends cost $36.31 for the castings with an estimated cost of $21.00 for machining, making a total cost of $57.31. Dry tons crushed 913,134. Cost per dry ton crushed $.00006276.

"The solid toggle, installed 3/15/41, was 36-3/4" long. It has renewable ends, purchased on order AGB-3519, dated 10/6/39. The castings cost $45.83 plus an estimated $21.00 for machining; making the toggle ends cost $66.83

"Manganese Steel Toggle Bearings: The 4 toggle bearings removed 3/15/41 were installed 10/8/39. They were furnished on order AGB-3264, dated 8/10/39. They cost delivered $172.27. The 4 new bearings weighed a total of 671 pounds, as per invoice. Life in service 17 months 7 days. Dry tons crushed 913,134. Cost per dry ton crushed $.0001.

"The 4 bearings installed 3/15/41 were old bearings, reconditioned by grinding. No cost data or life available."

The east 6x12 drag classifier speed reducer ran hot and was removed because of broken ball bearings on the low speed end. Installed the spare unit with double ball bearings both ends of the low speed shaft and double bearings on the on the thrust end of the high speed shaft, both with thrust in the same direction. The oiling device for the low speed bearings was doped with Permatex and asbestos and oil cutters of improved design were installed. Welded 3 flights on 6x12 drag flights and straightened several. A search was made for cause of broken and bent flights and a protruding bolt was found and cut off.

The drive belt on the spare Nash Hytor under the west Pb cells tore up and was replaced today. Mr. Mesloh gives the life

and cost data:

"The belt driving the 3-W Nash Hytor removed 3/15/41 was installed 5/3/37. It was a 16" 6-ply "Condor" brand of the Manhattan Rubber Company. Taped length of drive 36' 6". It was on the drive for 47 months 12 days, but only saw intermittent service, mostly in the summertime when the air pressure to the cells was low. The belt was in two sections. Crescent belt plates and rivets were used for fasteners. The belt was removed due to damage it suffered when it jumped off the pulleys while in operation, belt speed 3768' per minute. The belt can be saved for a spare, but it will need be spliced again. The belt is now in three pieces. No cost record available. Part of the belt, about 33', was in the supply house prior to 1929.

"The 16" 6-ply belt installed 3/15/41 was manufactured by the Goodyear Tire & Rubber Company, their "Wingfoot" brand. It was purchased on order GB-1525, dated 5/19/37. It was 38' long as received. It cost $79.00 delivered. The belt was cut to 37' 4-3/8" long, as installed, taped length of drive 37' 6-5/8"."

March 18, West mill repairs. Installed a set of new Dayton Cog Belts on #1 Marcy mill. The set removed with 64 months life was not entirely worn out, but it is now our policy to order a new set of belts when there are no more worn spares for replacement on hand and to install the new belts as soon as they are received so there will be no deterioration of rubber under improper storage conditions over long periods as has been the case in the past. The belts removed will be retained as spares for any of the 4 sets now in service. Mr. Mesloh gives the life and cost data of the belts as follows:

"Dayton Cog Belts: A set of eight Dayton Cog Belts, No. 2D44, installed 11/8/35, were removed 3/18/41. Life in service 64 months 10 days. These belts were purchased on order GB-5980, dated 7/30/34. They cost delivered $126.22.

"The set of Dayton Cog Belts installed 3/18/41 were purchased on order AGB-6400, dated 2/25/41. They cost delivered $138.71."

Removed one link from each chain of the 6x12 drag classifier, leaving 283 links with an average pitch of 4.178".

March 19, East mill repairs. The 6x12 drag classifier bottom was patched on the east side where running muck is wearing into the concrete by pebbles wedged in place and cemented in with hot asphalt.

March 20. Test was made in the zinc section producing iron concentrates on the east side and zinc concentrates for both units on the west side.

Mr. C. E. Taylor---Mill Repairs & Changes---March 1941

March 24. The mill was out of ore at 3:00 AM on the west side. General repairs were made while this mill was down. The Hardinge mill was shut down and a hole near the door was patched with a piece of North Carolina granite wedged in with steel and cemented in place with hot asphalt. The Hardinge motor was removed and a 1" steel foundation plate was installed to hold the motor in line with the driven shaft. The work was not completed by 3:30 PM and the Hardinge was not started as no electricians were available without paying overtime. It was decided to keep the Hardinge idle until the next morning because of the above conditions and because there is a shortage of ore from the mine at the present time.

March 25, East mill repairs. Removed the whole rod charge from the 6x12 Marcy and started to remove worn out head liners and shell liners preparatory to relining the mill. Work on relining was carried on 2 shifts today, but not on the 11-7 shift. Removed the 150 HP Fynn Weichsel motor for cleaning, varnishing and repairs. Installed a steel foundation on the concrete motor base for the spare 200 HP motor which is to run the 6x12 Marcy while the Fynn Weichsel is being repaired.

The Hardinge mill foundation plate for the motor was completed and the Hardinge was started.

March 26. Relining the east 6x12 Marcy mill 3 shifts. The 200 HP spare motor was installed on the steel frame which was bolted down by two 1-1/4" expansion bolts and by 2 bolts through the Fynn Weichsel bed rail. The Fynn Weichsel rotor was set up in the lathe and a cut was taken off the brush rings and commutator to true them up. The bearings were rebabbitted with new Carbonite Babbitt. They were made grooveless and of our latest design for motor bearings. The bolt holes in the shell for shell liner bolts were worn slot shaped in some cases 3" long (diameter of bolts 1-1/2"). The holes were arc-welded back to 1-1/2" diameter and were reamed. 84 pieces of 3/4" x 6" x 6" plate were arc-welded onto the outside of the shell, one at each bolt hole to prevent recurrence of the slotting and to reinforce the shell as a boss at each bolt hole.

March 27. Relining the east 6x12 Marcy mill 3 shifts. Weighed the minus 2" rods removed, 14885 lbs. Weighed the plus 2" rods which are to be put back, 28148 lbs. Total charge when the mill was shut down was 43033 lbs. (original charge after breaking in the mills was 40000 lbs. 2-1/2", 2" and 1-1/2" rods). Work continued all day and all night welding the 6x6x3/4" plates on the outside of the shell. Both arc-welders were kept busy in this service. A new set of 3/16" rubber backing was installed for shell liners. It was in 7 pieces 32" wide by 12' 10-1/2" long. The length of the shell was 12' 11-1/4". A new set of new style manganese steel shell liners was installed. The liners were changed as requested by us. They were made longer and wider to cut down the width of cracks between liners and the ends were bevelled instead of square so the crack is wedge-shaped, being larger at the outside than at the inside to hold calking or other material for filling cracks.

All shell liners were painted on all 4 edges with #14 Apkote emulsified asphalt paint and the cracks were filled with hot high melting point asphalt.

March 28. Relining east 6x12 Marcy 3 shifts. Installed new style discharge head liners and new head liners in the feed end. The feed end liners were old style liners which had to be cut off with the oxy-acetylene torch to fit on top of the new style shell liners. The shell liners extend from head to head and the head liners on both ends rest on the shell liners. The edges of the head liners where they rest against the shell liners were made bevelled to hold calking material. Old style shell liners were shorter; the head liners extended to the shell and the shell liners butted against the head liners. The cracks at both ends of the mill where the shell liners and head liners meet were filled with hot 1/2" stone and hot asphalt. The shell liners and head liners were a better fit than those originally furnished. The longitudinal cracks were less than 1/2" and were 1" or more in the original set. The space between head liners was also considerably less. It is hoped that with better fitting liners the maintenance on the mills will be greatly reduced.

March 29. Completed relining of the East 6x12 Marcy and started the mill at 1:30 PM. No mechanics were available to work the 11-7 shift of this day. 28148 lbs. of plus 2" rods from the old charge were put in the mill and to this was added 41 new 3" rods, 11767 lbs., making a total charge of 39915 lbs. The volume was estimated at 43%, tops of rods being 9" below the center of the mill, about 4" lower than a customary charge. Power after starting was 138 HP. The 200 HP motor ran the mill at 18.2 RPM, about .5 RPM slower than the Fynn Weichsel. Mr. Mesloh gives the life and cost data on all shell and head liners as follows:

"Shell Liners: The set of shell liners (28 pieces) removed 3/25/41 were installed 10/15/36. Life in service 53 months 10 days. They were purchased on order GB-12058, dated 7/8/36, as part of original equipment of the mill. Estimated cost of liners $2627.06. Austinville weights 24,188 lbs. Weight when removed 13,620 lbs., total. Individual weights, short, 467, 457, 463, 486, 455, 435, 490, 445, 435, 489, 478, 475, 400, 443, total 6418; long 520, 540, 530, 518, 475, 517, 538, 493, 535, 527, 531, 495, 505, 478, total 7202. Pounds of metal lost, 10,568. Percent of original weight lost 43.69%. Pounds of metal lost per dry ton crushed .0215334.

"The East Unit treated 1,348,275 dry tons. The tonnage ground by the 6x12 Marcy mill is estimated to be 36.4% of the total or 490,772. Cost per ton of ore ground $.0053529.

"The shell liners installed 3/25/41 were purchased on order AGB-5550, dated 10/14/40. They weighed new 25,070 lbs., per invoice; 25,584 lbs. on Austinville scales. They cost delivered $2690.01. These liners are longer than the set removed. They fit

from head to head of the mill. The ends of the liners are bevelled undercut, so as to hold packing material to keep ore from wearing the shell. Individual weights of liners, 1-A, 965, 958, 950, 970, 970, 964, 965, total 6742; 2-A, 861, 881, 895, 865, 855, 861, 863, total 6081; 3-A, 860, 861, 854, 851, 856, 865, 860, total 6007; 4-A, 970, 970, 960, 944, 985, 960, 965, total 6754; grand total 25,584 lbs.

"Feed End Head Liners: The set of feed end head liners removed 3/25/41 were installed 10/15/36. Life in service 53 months 10 days. They were purchased on order GB-12058, dated 7/8/36, as part of original equipment of the mill. Estimated cost of liners, delivered, is $315.28. Austinville weights 2810 lbs. Weight when removed 1856 lbs. Individual weights worn liners, 200, 200, 270, 195, 267, 197, 267, 260 lbs. Pounds of metal lost 954. Percent of original weight lost 33.95%. Pounds of metal lost per dry ton crushed, .001944 lbs. The East Unit treated 1,348,275 dry tons. The tonnage ground by the 6x12 Marcy mill is estimated to be 36.4% of the total, or 490,772 tons. Cost per ton of ore ground, $.0006424.

"The feed end head liners installed 3/25/41, were purchased on order AGB-2714, dated 5/6/39. They weighed new 2815 lbs., per invoice, Austinville weights 2837 lbs. They cost delivered $315.28. Due to having shell liners that fit against the head, the ends of the head liners need be cut off as these liners were purchased for the old style shell liners. Weight of metal cut off of liners, total 431 lbs. Weight of new liners installed 2384 lbs,, invoice (2815--431), or 2406 lbs. Austinville weights (2837--431).

"Discharge End Head Liners: The set of discharge end head liners removed 3/25/41 were installed 10/15/36. Life in service 53 months 10 days. They were purchased on order GB-12058, dated 7/8/36, as part of original equipment of the mill. Estimated cost of liners delivered is $296.46. Austinville weights 2586 lbs. Weight when removed 1479 lbs. Pounds of metal lost, 1107. Percent of original weight lost 42.81%. Pounds of metal lost per dry ton crushed .0022556.

"The East Unit treated 1,348,275 dry tons. The tonnage ground by the 6x12 Marcy mill is estimated to be 36.4% of the total, or 490,772 tons. Cost per ton of ore ground, $.0006041. Individual weights of liners removed: 155,220, 216, 156, 162, 162, 218, 190, total 1479 lbs.

"The discharge end head liners installed March 25, 1941, were purchased on order AGB-5550, dated 10/14/40. Invoice weight 2410 lbs., Austinville weight 2276 lbs. They cost delivered $264.62. These liners were of the new design to fit over the long shell liners. The end of the liners that fit against the shell liners was bevelled undercut, so as to hold packing material to keep ore from wearing the shell. Individual weights: 315, 305, 310, 320, total 1250; 263, 258, 255, 250, total 1026, grand total 2276.

"Rubber Backing: The rubber backing furnished with the

mill on GB-12058, dated 7/8/36 was 12" wide belting split to make 2 pieces 12" wide by 3/16" thick. The backing was removed 3/25/41.

"The backing installed 3/25/41 was purchased on order AGB-5359, 8/26/40, from the Manhattan Rubber Company. It was furnished in 7 pieces, 32" wide by 154-1/2" long, made of 3 plies of duck with 1/32" rubber coating on both sides. It was approximately 1/4" thick. The backing cost delivered $217.28.

"The old rubber backing under feed and discharge end head liners was reinstalled."

March 31. Shut the east 6x12 Marcy down to tighten liner bolts and to add rods to the rod charge.

WEIGHTOMETER TESTS

	West		East
3/4/41	OK	3/5/41	.22% high
11	.48% low	12	.88% low
18	OK	19	OK
24	.22% low	25	.79% high

Average screen analyses, feed to flotation:

East Unit: 3.3% on 48-mesh, 11.8% on 65-mesh; 23.3% on 100-mesh; 50.8% on 200-mesh; all cumulative.

West Unit: 3.4% on 48-mesh, 13.1% on 65-mesh; 25.1% on 100-mesh; 52.9% on 200-mesh; all cumulative.

POWER FOR GRINDING---KWH PER TON

	West	East	Total
Dry Tons Crushed	26593.7	25202.5	51796.2
Telsmiths	.247	.219	.233
Gyraspheres	.666	.684	.675
6x12 Marcys	3.347	3.059	3.203
Hardinge Mill	1.014	1.070	1.042
4x10 Marcys	3.572	3.741	3.656
TOTAL	8.846	8.773	8.809

WATER FOR FLOTATION

	Average	Maximum	Minimum
Turbidity	26	80	11
pH	7.3	7.7	7.2
Temperature, F.	55	61	50

Total rainfall 2.48". Maximum .50" on 3/7/41 (7" snow)

Mr. C. E. Taylor---Mill Repairs & Changes---March 1941

COPY

TIME LOST, BASED ON TELSMITH RUNNING TIME

East Unit:

3/3/41	5 Minutes, Feed chute choked. Ore bin empty, part feed 1 hr 10 min.
5	4 Hours, General repairs.
9	5 Minutes, Hopper choked under Telsmith.
10	Part feed 40 minutes, ore low in bin.
12	3 Hours 35 Minutes, General repairs. 6x12 Marcy by-passed 1 hr 30 min, dipper lip loose.
15	1 Hour 55 Minutes, 6x12 drag overloaded 10 min. Changing 6x12 drag speed reducer 1 hr 45 min.
19	3 Hours 10 Minutes, General repairs.
21	5 Minutes, Hardinge feed pump belt broken.
25	3 Hours 10 Minutes, General repairs 2 hrs 40 min, 4x10 Marcy overloaded 30 min. 6x12 Marcy by-passed 16 hrs 30 min for relining.
26	20 Minutes, 4x10 Marcy overloaded, 6x12 Marcy by-passed 24 hrs for relining.
27	10 Minutes, 4x10 Marcy overloaded.
28	6x12 Marcy by-passed 24 hrs for relining.
29	6x12 " " " 16 " 20 min for relining.
30	1 Hour 5 Minutes, Lifting rod (long rod) broken on Pb Dorr Bowl Classifier.
31	10 Minutes, 4x10 Marcy overloaded 5 min. By-passing 6x12 Marcy 5 min. 6x12 Marcy by-passed 1 hr 55 min tightening liner bolts.

West Unit:

3/3/41	Ore bin empty, part feed 1 Hour 10 Minutes.
4	5 Hours 10 Minutes, General repairs.
5	1 Hour 35 Minutes, Oil pipe on Telsmith choked. Set up Gyrasphere.
7	35 Minutes, Blowing out oil line at Telsmith. 6x12 Marcy by-passed 20 min tightening liner bolts.
9	25 Minutes, Hopper under Telsmith choked.
10	Part feed 40 minutes, ore low in bins.
11	8 Hours 15 Minutes, General repairs 5 hrs 30 min. Out of ore 2 hrs 45 min. Part feed 1 hr 45 min, ore low in bin.
12	15 Minutes, Stopping oil leak at Telsmith. 6x12 by-passed 1 hr 25 min tightening shell liner bolts.
13	5 Minutes, Chute to #1 Marcy choked.
14	6x12 Marcy by-passed 35 min patching feed chute.
15	10 Minutes, Feed chute to #1 Marcy choked.
18	2 Hours 40 Minutes, General repairs.
19	6x12 by-passed 10 min tightening liner bolts.
20	15 Minutes, Reeves transmission belt broken.
21	5 Minutes, Hardinge feed pump belt broken.
24	7 Hours 30 Minutes, Feed chute choked 5 min. Out of ore 4 hrs. General repairs 3 hrs 25 min.

Hardinge Mill:

3/7/41	Hardinge feed by-passed 2 Hours 10 Minutes pumping out dam.

Mr. C. E. Taylor---Mill Repairs & Changes---March 1941

3/11/41	4 Hours, Inspecting lining, changing grease in gears.
14	35 Minutes, Patching hole in chute over Hardinge.
21	10 " Installing new belt on feed pump.
24	16 Hours, Patching hole in lining and installing new base plate under the Hardinge motor.
25	13 Hours, Lining up Hardinge motor.
26	1 Hour 30 Minutes, Stopping leak around door. Feed to Hardinge by-passed 5 hrs 45 min cleaning out dust chamber and pumping dam.

(Signed) L. J. Weintz

March 18, 1941

No 1 Money Mill.

Dayton Cog Belts. A set of eight Dayton Cog Belts, No 2D 44, installed 11-8-35 were removed 3/18/41. Life in service 64 months 10 days. These belts were purchased on order GB 5980 dated 7/30/34. They cost delivered $126.22.

Dayton Cog

The set of belts installed 3/18/41, were purchased on order AGB 6400 dated 2/25/41. They cost delivered $ 138.71.

K. M.

March 18, 1941.

3W Nash Hyton Drive Belt.

The belt driving the 3W Nash Hyton, removed 3/15/41 was installed 5/3/37. It was a 16" 6 ply "Condor" brand of the Manhattan Rubber Co. Taped length of drive 37 ft 6". It was on the drive for 47 mos 12 days, but only intermittant service, mostly in the summer time, when the air pressure to the cells was low. The belt was in two sections. Crescent belt plates and rivets were used for fasteners. The belt was removed due to damage it suffered when it jumped off the pulleys, while in operation. The belt can be saved for a spare, but it will need to be spliced again. The belt is now in three pieces. No cost record available. Part of the belt, about 33 ft was in the supply house prior to 1929. Part of belt 3768 #

The 16" 6 ply belt installed 3/15/41, was manufactured by the Goodyear Tire & Rubber Co, their "Wingfoot" brand. It was purchased on order GB 1525 dated 5/19/37. It was 38 ft long as received. It cost $79.00 delivered. The belt was cut to 37 ft 4 3/8" long, as installed, taped length 37 ÷ 6 7/8" / drive.

K.M.

March 18, 1941

30" x 42" Buchanan Jaw Crusher

Safety Toggle. The 25" safety toggle, removed 3-15-41 was installed 10-8-39, life 17 mos 7 days. Ins tons crushed 913,134. Cost per dry ton crushed $.00010817 The toggle was purchased on order AGB 3264 dated Aug 10-1939, ft cost delivered $98.77. The toggle weighed 664 pounds new as per invoice.

The safety toggle installed 3-15-41 ft was 24½" long. It was an old toggle, reconditioned by grinding the ends.

Solid Toggle The solid toggle, removed 3-15-41 was installed 10-8-39., life 17 mos 7 days. It was 36" long. It had renewable ends, purchased on order AGB 9159 dated 9/18/36. The two ends cost a $36.31 for the castings with an estimated cost of $21.00 for machining, making a total cost of $57.31 Ins tons crushed 913,134. Cost per dry ton crushed crushed $.00006276

The solid toggle, installed 3-15-41 was 36½" long. It has renewable ends, purchased

on order AGB 3519 dated 10/6/39. The castings cost $45.83 plus an estimated $21.00 for machining, making the toggle ends cost $66.83.

Manganese Steel Toggle Bearings The 4 toggle bearings removed 3/15/41 were installed 10/8/39. They were furnished on order AGB 3264 dated 8/10/39. They cost delivered $172.27. The four new bearings weighed a total of 671 pounds as per invoice. Life in service 17 mo. 7 days. They tons crushed 913,134. Cost per dry ton crushed $.0001

The four bearings installed 3/15/41 were old bearings, reconditioned by grinding. No cost data or life available.

K.M.

Service File

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May 16, 1941.

Mr. C. E. Taylor, Office.

Mill Repairs & Changes in April

April 1, West mill repairs. Removed one link from each chain of the 6x12 drag classifier, leaving 282 links with average pitch of 4.192". Repaired the Telsmith Reeves Transmission, installing one new disc and shaft.

April 2, East mill repairs. Dismantled the Gyrasphere crusher to replace wearing parts (end of take-up). The mantle and concave were removed and spares were installed. The mantle installed this time was one used and discarded because it was so much worn that with a new concave there would not have been sufficient take-up to justify putting it back in service. To overcome this it had been shimmed with 1/4" steel wedges and then zinced to the sphere head, after which the steel wedges were removed. The thickness of zinc backing is therefore 1/4" greater than normal and the machined surface on the bottom of the mantle is 1/4" above the machined surface of the sphere head (normal setting is with these two surfaces metal to metal). A new concave was installed. The crusher was set to 1/4" opening and had 9 set up lines showing, which is about normal when both mantle and concave are new. New seal leathers were installed. Changed oil. Examined all wear protectors and found them in good condition. The bronze sleeves were examined and found OK. Mr. Mesloh gives the life and cost data of crusher parts:

"Lower Mantle: The lower mantle #19 removed from the east Gyrasphere crusher 4/2/41 was installed 5/1/40. Life 11 months 1 day. Dry tons crushed 269,629. Cost per dry ton crushed $.0003800. It was purchased on order AGB-4017, dated 1/2/40. It cost delivered $102.45. It weighed new 528 pounds. Weight when removed 276 pounds. Percent of original weight lost 47.73%. Pounds of metal lost per ton of ore crushed .0009346.

"#12 Lower Mantle was installed 4/2/41. It was mounted with 1/4" of zinc metal as a shim, between sphere head and lower edge of mantle. It had seen previous service of 5 months 3 days, crushing 140,620 tons. As installed it weighed 409 pounds. It was purchased on order GB-3204, dated 5/2/38.

"Concave Ring: #17 Concave Ring removed 4/2/41 was installed 5/1/40. Life 11 months 1 day. Dry tons crushed 269,629, the record to date. Cost per dry ton crushed $.0004251. It was purchased on order AGB-3606, dated 10/9/39. It cost delivered $114.62. It weighed new 640 pounds. Weight when removed 341 pounds. Percent of original weight lost 46.72%. Pounds of metal lost per ton of ore crushed .0011089.

"#19 Concave Ring was installed 4/2/41. It was pur-

chased on order AGB-4877, dated 5/28/40. It weighed new 612 pounds. It cost delivered $108.75."

Removed the 6x12 drag classifier Philadelphia Speed Reducer and installed the spare which had been fitted with a long slow speed shaft and a 2-15/16" Dodge outboard bearing. The outboard bearing was mounted on rigid arc welded steel supports. This arrangement is expected to materially increase the life of speed reducer ball bearings which was formerly 1 to 3 months and which has now been increased to 6 months by the installation of special oiling devices and by increasing the strength of ball bearings.

Opened the east 6x12 Marcy to inspect the new lining. Liners are much better fitting than former ones and will peen and close cracks. The cracks filled with 1/2" rock and hot asphalt seem to be holding satisfactorily. There were no leaks when the mill was started; asphalt poured on the shell liner bolt heads on inside of mill made it water tight at these points. Cleaned Crater Compound off the 6x12 Marcy gears and applied Lubriplate.

The 6x12 drag flights were straightened and a search was made for the cause of bent flights. A remnant of a former launder was found to be projecting from the west side of the classifier trough near the tail end. It was cut off. The west strand of chain is worn more than the other 2 on this classifier, which causes the chain to ride against the west trough side and any projection will catch and bend the flights. The chain wears unequally because of all coarse feed on the west side of the drag and all fine feed on the east side.

April 5, Start of curtailed mill operation. New working schedules for the mill men were posted, the men being changed about so the oldest qualified employes received the highest ranking jobs. Both mills were shut down at 11:00 PM today andthere was one caretaker on each shift thereafter till 7:00 AM Monday, April 7,. Feed was cut off both mills at 8:30 PM and they were run empty by 11:00 PM. Hereafter both mills are to be shut down at 7:00 AM and all mill repairs are to be carried out. A shift of mill men (except shift boss and clean-up man) will be available every Saturday 7-3 shift to shut the mills down and to help with repairs. There will be no 3-11 shop shift as in the past, unless men are called out for special duty. Eight mill men were released for the yard and shop. The #1 Dorr Tanks (E & W) in Pb and Zn sections and the pumps on these tanks were kept in operation throughout the shut down with the tank spigot recirculating to keep the tanks in running condition in order to avoid delay when the mill is started. This is to be a regular practice on all shut-downs hereafter. The caretakers' duties are to punch 6 watchman's stations every hour in the plant and mill as required by the Factory Mutual Insurance Company, to move 6x12 Marcys and keep them oiled, to move 6x12 drags, to oil Dorr Tank mechanism and pumps, to cut off all running water, to maintain heat in the mill in freezing weather, and to watch for and report any unusual circumstances.

Mr. C. E. Taylor---Mill Repairs & Changes in April 1941

April 9. Special Eastman Creosotes were tried in the mill in barrel lots, #35AB in the east side and #2-35-3A in the west side. As the result of these barrel lot tests, #35AB Creosote was selected and ordered.

April 12. Feed off both mills at 7:00 AM. East mill repairs: Removed one link from each chain of the 6x12 drag classifier, leaving 283 links with an average pitch of 4.206". Removed the 200 HP spare motor from the 6x12 Marcy and installed the reconditioned Fynn Weichsel motor which had been completely cleaned, dried and revarnished and which was equipped with new leads and new brush rigging and 2 new Carbonite Babbitt grooveless bearings. The motor was kept running idle throughout the present shutdown to break in the new bearings.

West mill repairs. Repaired the Telsmith dust guard. Removed one link from each chain of the 6x12 drag classifier, leaving 281 links with an average pitch of 4.207".

Washed out the auxiliary water tank with fire hose connected to drain in bottom of tank. There was about 2" of mud in the bottom of tank. This is the yearly cleaning of this tank.

April 19. Feed off both mills at 7:00 AM. Changed oil in the west Telsmith crusher and installed a guard over the drive pulley. Made usual adjustments and inspections.

April 26. Feed off both mills at 7:00 AM. West mill repairs: Removed the Fynn Weichsel motor from the 6x12 Marcy for varnishing and repairs. Installed steel foundation and the spare 200 HP, 587 RPM motor which is to be used while repairing the Fynn Weichsel. Removed the Duplex Classifier motor for cleaning and repairs and installed a spare 15 HP slip ring 1800 RPM motor with a 5" motor pulley to give the same speed as the 15 HP 1160 motor. Removed one link from each chain of the 6x12 drag classifier, leaving 280 links with an average pitch of 4.223".

East mill repairs. Dismantled the Telsmith crusher to install new inner and outer Ryertex sleeves of simplified design. The present Ryertex sleeves have been in constant service since April 21, 1939, and while showing some signs of wear should be good for another 2 years. It was considered advisable at this point to purchase, install and break in the new bearings before the present ones are ready to discard. The breaking in of the first bearings was a costly operation, and it is hoped the new design will eliminate some of the trouble experienced. The present bearings were made thinner than the original ones and practically of the same design as the original babbitt sleeve, and there is very little more trouble installing them than there was installing babbitt sleeves. The life of Ryertex sleeves should be 10 to 20 times that of babbitt sleeves. A new countershaft and pinion was installed. Also installed new bronze countershaft bearing sleeves, new countershaft bearing housing, new 1/2" throw eccentric and gear, new upper wearing plate on crushing head, new lower head support, newly machined lower head plate, reconditioned oil sleeve with

steel extension to make seal neck 1/2" longer than standard oil sleeves, and new Ryertex bottom wearing ring. Changed oil, cleaned oil pipes and tank. Installed guard on the driven pulley. The above repairs were completed at 3:00 PM and the crusher was started, our intentions being to run it idle for the following 40 hours, but in 10 minutes the countershaft bearing heated and the crusher had to be shut down. It was then left idle till 7:00 AM Sunday.

April 27. At 7:00 AM removed the East Telsmith oil pump top casing and moved the oil pump drive gear, which was pressing on the end of the bearing, making it heat up. At 3:00 PM it was started again and after a short run oil started leaking between the taper head and the bottom head plate. There was also a thumping noise and it was considered unsafe to run. At 8:00 PM it was decided to remove the new Ryertex bearings and put back the old ones so the crusher would be ready for feed at 7:00 AM Monday, April 28. A repair crew was called out and repairs were completed at 2:00 AM April 28. Installed the old eccentric and gear and Ryertex sleeve, the old Ryertex wearing ring, the old lower head support and the old crushing head with old Ryertex sleeve in it. Left the new oil ring, top wearing ring and all other new parts.

April 29. The east Telsmith crushing head removed on April 26 was taken to the shop for inspection. The bottom head plate was removed and was trimmed out at the bevelled flange that hangs down over the packing ring retainer. It was trimmed where it was striking the retainer which probably caused the thumping noise that was heard. The bottom surface of the taper head was rough, though it had been machined originally, and it was necessary to put the plate back with Permatex in the joint to prevent oil leakage at that point. The Ryertex bearings showed no signs of wear. It was decided to install one of the new Ryertex bearings at a time to break them in.

WEIGHTOMETER TESTS

West		East	
4/1	.23% high	4/2	OK
12	.15% low	12	.53% low
18	Cleaned & overhauled	19	.55% high
19	1.54% high	25	Cleaned & overhauled
26	OK	26	.43% high

Average screen analyses, feed to flotation:

East Unit: 2.7% on 48-mesh; 10.4% on 65-mesh; 22.2% on 100-mesh; 50.1% on 200-mesh; all cumulative.

West Unit: 2.0% on 48-mesh; 9.8% on 65-mesh; 22.0% on 100-mesh; 50.0% on 200-mesh; all cumulative.

Mr. C. E. Taylor---Mill Repairs & Changes in April 1941

COPY

POWER FOR GRINDING--KWH PER TON

	West	East	Total
Dry Tons Crushed	20078.5	19894.3	39972.8
Telsmiths	.243	.209	.226
Gyraspheres	.664	.665	.664
6x12 Marcys	3.307	3.192	3.250
Hardinge Mill	1.021	1.030	1.026
4x10 Marcys	3.529	3.512	3.521
TOTAL	8.765	8.609	8.687

WATER FOR FLOTATION

	Average	Maximum	Minimum
Turbidity	19	24	8
pH	7.4	7.5	7.4
Temperature, F.	60	73	55

Total rainfall 2.26". Maximum 1.03" 4/4/41.

TIME LOST FOR REPAIRS, BASED ON TELSMITH RUNNING TIME

East Unit:

4/2/41 6 Hours, General repairs 5 hrs 40 min; 4x10 Marcy overloaded 10 min, setting up Gyrasphere 10 min. The 6x12 Marcy was down a total of 9 hrs 30 min.
3 5 Minutes, 4x10 Marcy overloaded. The 6x12 Marcy was down 1 hr 30 min because of low water in storage tank.
5 2 Hours 30 Minutes, Feed off at 8:30 PM, start of curtailed mill operation.
7 5 Minutes, Starting mill after 4-shift shutdown.
9 10 " Setting up Gyrasphere.
12 Mill down 48 hours over week end.
14 10 Minutes, Starting mill after 6-shift shutdown.
15 The 6x12 Marcy was by-passed 15 min working on motor.
19 Mill down 48 hours over week end.
21 5 Minutes, Starting mill after 6-shift shutdown.
26 Mill down 48 hours over week end.
28 5 Minutes, Starting mill after 6-shift shutdown.

West Unit:

4/1/41 3 Hours 45 Minutes, General repairs.
2 5 Minutes, #1 Marcy feed chute choked.
5 3 Hours 5 Minutes, Piece of steel plate hung in chute under Telsmith. Feed off at 8:30 PM, start of curtailed mill operation.
7 5 Minutes, Starting mill after 4-shift shutdown.
11 1 Hour, Fuse blown in Telsmith crusher motor.
12 Mill down 48 hours over week end.
14 10 Minutes, Starting mill after 6-shift shutdown.
16 10 " Telsmith crusher oil pipe choked.
19 Mill down 48 hours

Mr. C. E. Taylor---Mill Repairs & Changes in April 1941

4/21/41	20 Minutes, Starting mill 5 min, Working on Telsmith sight oil feeder 15 min.
23	6x12 Marcy by-passed 35 min putting in shell liner bolt.
26	Mill down 48 hours.
28	30 Minutes, Pb Dorr Classifier hung up at start of mill.

Hardinge Mill:

4/5/41	2 Hours 30 Minutes, Shutting down for week end.
7	20 Minutes, Starting up
12	Down 48 hours
14	10 Minutes, Starting up
19	Down 48 hours
21	5 Minutes, Starting up
26	Down 48 hours
28	30 Minutes, Starting up.

(Signed) L. J. Weintz

Marcy File

COPY

June 11, 1941.

Mr. C. E. Taylor, Office.

Mill Repairs & Changes--May 1941

May 3, West mill repairs. Installed new elevator wheel on the 6x12 Marcy mill. Installed a pair of new cast iron oversize (4-5/16" pitch) head sprockets on the 6x12 drag classifier. These sprockets should wear out the present chain, pitch of chain 4.23". The chain fitted snugly on the sprockets, there was no slippage. Mr. Mesloh gives the life and cost data of classifier head sprockets:

"Head Sprockets: The head sprockets, installed in 1-W drag 10/8/40 were removed 5/3/41. Life 6 months 25 days. Dry tons conveyed 170,546. Cost per dry ton conveyed $.00092257. The sprockets were made at Austinville of 1-1/4" solid plate with old couplings used as hubs. Cost of sprockets as follows:

Plate	$40.59
Labor, plus overhead	116.75
	$157.34

"The sprockets were single pitch, 4.18". They were mounted on a 3-15/16" round diameter shaft. The teeth of the used sprockets can be machined off and the plates made for service with demountable rims.

"The new sprockets, installed 5/3/41, were made with solid steel plate centers 1" thick with cast iron coupling halves for flanges. The rims were made of cast iron, cast at Palmerton, single pitch 4.31". The shaft was made from an old 4" square shaft, turned down to 3-15/16" round diameter.

"The sprockets cost as follows:

Plate	$ 21.95
Bolts & Nuts	6.24
Labor, plus overhead	191.99
Rims, Metal	15.01
Lumber	6.13
Freight	2.33
Pattern	52.42
	$311.01

"The estimated cost of the next pair of solid rim, 4.31" single pitch sprockets installed will be as follows:

Rims	$ 15.01
Lumber	6.13
Freight	2.33
Labor, plus overhead	23.71
	$ 47.18"

Mr. C. E. Taylor---Mill Repairs & Changes---May 1941

COPY

May 10, East mill repairs. Removed the Telsmith crushing head and installed the spare with used #14 mantle and new Ryertex outer sleeve. The one installed is the same as was installed April 27, 1941, and removed the same day because of oil leaks and a thumping noise. The bottom head plate had been machined where it struck the band which holes the packing ring in place and was sealed with Permatex to make a tight joint between the bottom head plate and the taper head. The new inner Ryertex sleeve was not installed this time so there will be only one of these special sleeves to break in at a time. Mr. Mesloh gives the life and cost data of Ryertex bearings:

"The outer Ryertex bearings removed 5/10/41 from the 1-E crusher were installed 4/21/39. The bearings are not worn out but were removed because the taper head and manganese steel mantle were taken out. The bearings will be installed at some future date.

"These bearings were purchased on order GB-1687, dated 10/4/37. The material cost of the inner and outer bearings was $190.51. The total cost for both sets was $719.62. The extra cost of $529.11 was spent on machining the pieces of the crusher so as to hold the bearings, setting up the spare crusher and breaking in the bearings.

"The bearing segments were made and installed as per drawing 8-GB-1061, 3/15/37.

"The set of bearings installed 5/10/41 were purchased on order AGB-4774, dated 5/9/40. They cost delivered $106.88. They were furnished as per drawing 8-GB-2047, Revised 5/4/40.

"Labor cost for installation in taper head estimated to be $24.32, plus $7.30 shop burden, or $31.62. Total cost of bearings installed $138.50."

After installing the new head the Telsmith was operated for a few minutes to observe the size of ore produced. There was no change of shims (1/2") and product was 1-1/2" to 2", slightly smaller than before. Mr. Mesloh gives the life and cost data of crusher parts:

"#12 Mantle: The mantle removed from 1-E Telsmith crusher 5/10/41 was installed 4/21/39. Life 24 months 19 days. Dry tons crushed 624,820. This mantle had seen previous service of 3 months 13 days, crushing 65,427 dry tons. Total dry tons crushed 690,247. Total life 28 months 2 days. This mantle was purchased on order GB-7576, 9/24/35. It cost delivered $225.58. Cost per ton crushed $.0003268.

Mr. C. E. Taylor---Mill Repairs & Changes---May 1941

"The mantle is not quite worn out and will be put in for future service.

"#14 Mantle: The mantle installed 5/10/41 had seen previous service of 8 months 23 days, crushing a total of 241,502 dry tons. The taper head for this mantle has been fitted with new Ryertex bearings. As soon as these bearings are broken in good, the mantle will be removed and #12 reinstalled to be worn out. The mantle was purchased on order GB-2161, 9/23/37. It cost delivered $281.18."

Installed a reconditioned plug door in the west 6x12 Marcy. Installed a reconditioned 15 HP 1160 motor on the E Duplex Classifier. Removed and cleaned the E Pb Bowl Classifier motor.

May 13. An estimate was made of the life of Telsmith crusher mantles which are on hand mounted on taper heads:

#12 in yard, crushed 690,247 tons, estimated good for 100,000 tons or 5 months (removed from 1-E 5/10/41).

#13 in yard, crushed 513,304 tons, estimated good for 240,000 tons or 12 months.

#14 now in E Telsmith, 241,502 tons, estimated good for 550,000 tons or 27 months.

#15 now in W Telsmith, 560,000 tons, estimated good for 220,000 tons or 11 months.

#16 now in yard. Estimated life 790,000 tons or 39 months.

If the above estimates are realized, we should have sufficient for 4 years at present rate of crushing in 2 units.

May 16. The east Telsmith crusher oil temperature rose to 130° F while feed was normal, 38 TPH. The oil appeared black and dirty so was changed. Breaking in the new outer Ryertex sleeve.

May 17, West mill repairs. Removed the 200 HP spare motor from the 6x12 Marcy and put back the reconditioned Fynn Weichsel motor with new leads and new grooveless bearings. The motor had been thoroughly cleaned, dried and varnished, commutator and brush rings were remachined to a smooth surface. The motor was operated idle for 40 hours to break in the new bearings. Removed one link from each chain of the 6x12 drag classifier, leaving 278 links with an average pitch of 4.253". Installed a reconditioned 15 HP 1160 motor on the Duplex Classifier. Installed steel support for outboard bearing for the 6x12 drag speed reducer. Inspected the Dorr Bowl Lead Jones Speed Reducer and ordered a set of bushings for it. Installed a new 6" x 4-1/2" flanged Ni-Hard ell to feed the

zinc Dorr Bowl Classifier.

East mill repairs. Inspected the 6x12 drag classifier to find the cause of bent flights. Found the tail shaft was set so the west sprocket was 1" closer to the side of the classifier trough than the east sprocket. It was jacked back to the center and held in place with set collars. Straightened all flights and welded ends on 2 broken ones.

Installed a set of 110 new flame hardened flights 4" x 3/8" x 44" in the top tailings drag.

May 19. The Dings head pulley in Rock House was disconnected at 1:45 PM because of ground in mine which caused blowing of magnet fuses. The ground in mine was located on May 23 and fixed and the magnet was then put back in service. In the period from May 19 to May 23 there was no protection against steel missed by the Ohio magnet in the Telsmith and Gyrasphere crushers. From 20 lbs. to 40 lbs. of steel per week is caught by the Dings when it is operating. No trouble developed this month from the Dings being out of commission (later, on June 10, there was a 2-shift loss of time and an expensive repair job on the east Gyrasphere due to a piece of steel passed through the crusher on June 5, indicating the advisability of installation of 2 protective magnets ahead of the Gyrasphere crushers as previously recommended).

May 20. Two hours fifteen minutes running time was lost in both mill units by failure of the auxiliary pump automatic switch. A duplicate switch will be installed to avoid this loss in the future.

May 21. Started using the spare Nash compressor under the W Pb Section to raise flotation air to 6-1/2 lbs. pressure. There are now 4 Nashes in operation, #2, #3, #4 and #3W.

May 23. At 7:00 PM all A. E. P. power into the plant was off for 45 minutes. Both lines were out and it was impossible for a while to get in touch with the power people. The mill lost 2-1/2 hours, E & W, in the worst choke up since the start of the mill in 1927. A start was made at closing the bulkheads in the mine for protection of mine pumps. A Diesel engine for the operation of a stand-by generator of sufficient capacity to operate the mine pumps should be installed for the protection of the plant against A. E. P. power failure of this kind and duration.

May 24. Feed was cut off the east mill at 7:00 AM and the west at 12:30 PM.

East Mill Repairs: Changed oil in the Gyrasphere crusher. A stop for the Telsmith countershaft bearing was installed and the oil slinger inside of the oil pump housing on the countershaft was removed and oil drain pipes were changed to facilitate oil flow; all of this was done to stop oil leaks around the Telsmith oil pump and bearings. (Later the cause of oil not running away from the

oil pump gears was found in the cap of the oil tank being air tight, it was vented and the drain pipes then worked as they should). A spacer was installed in the tail shaft of the 6x12 drag to hold it in position and one worn out bearing was replaced. A new cam roller was installed in the east side of the Duplex Classifier.

West Mill Repairs: Removed one link from each chain of the 6x12 drag, leaving 278 links with an average pitch of 4.253".

No. 1 Nash Hytor was connected to the west Nash motor so there are now 4 Nashes in operation for the summer months.

May 25. Mine crusher repairs. The mine crusher jaw plates were reversed in the stationary and swing jaws. Before reversing when on the top center the pitman hung plumb and on bottom center 3/8" out of plumb in 18" toward the jaws. After reversing plates on top center 9/16" out of plumb away from the jaws and on bottom center 7/16" out of plumb away from jaws (all with 18" level). There were 2-1/4" shims placed in the crusher for 3-3/4" opening when the jaws were closed and 4-1/4" with jaws open. Installed one tension rod spring and 2 new bottom cheek plates, one set of bolts for new cheek plates and 8 new wedge bolts. The toe lugs were worn but will last till jaw plates are worn out.

May 27. Installed a set of new cast iron head sprockets with 4.18" pitch on the top tailings drag; the old ones were worn out. At the same time changed the speed of drag from 21.2 2.12' per minute to 18.6' per minute by changing the driven pulley from 14" to 16".

May 30. The plant was shut down for 24 hours from 11:00 PM May 29 to 11:00 PM May 30 for Memorial Day holiday.

May 31. Feed was cut off the west mill at 7:00 AM and off the east mill at 12:30 PM.

West Mill Repairs: Opened the 6x12 Marcy to inspect linings which appeared to be good for 2 months further service. The feed end trunnion liner was found to be worn out and will be replaced in 2 weeks. The dipper will also be replaced at that time. Removed 18,099 lbs. of minus 2" rods from the 6x12 Marcy and added 65 new 3" rods, 18,915 lbs. Installed the spare Philadelphia Gear Reducer with outboard bearing on the 6x12 drag classifier.

East Mill Repairs: Cut 1" off the west end of all 6x12 drag flights to keep them from bending.

WEIGHTOMETER TESTS

	West		East
5/3	.25% high	5/3	.65% high
10	1.15% low	10	.67% high
17	.29% low	17	.86% low
24	OK	24	.46% low
31	.58% high	31	.62% high

Mr. C. E. Taylor---Mill Repairs & Changes---May 1941

Average screen analyses, feed to flotation:

East Unit: 2.6% on 48-mesh; 9.6% on 65-mesh; 21.2% on 100-mesh; 48.9% on 200-mesh; all cumulative.

West Unit: 1.9% on 48-mesh; 9.6% on 65-mesh; 21.6% on 100-mesh; 49.5% on 200-mesh; all cumulative.

POWER FOR GRINDING---KWH PER TON

	West	East	Total
Dry Tons Crushed	19309.0	19340.6	38649.6
Telsmiths	.234	.219	.226
Gyraspheres	.692	.680	.686
6x12 Marcys	3.352	3.314	3.333
Hardinge Mill	1.056	1.055	1.056
4x10 Marcys	3.544	3.568	3.556
TOTAL	8.878	8.836	8.857

WATER FOR FLOTATION

	Average	Maximum	Minimum
Turbidity	20	45	8
pH	7.5	7.7	7.3
Temperature, F	73	81	67

Total rainfall .46". Maximum rainfall .32" on 5/7/41.

TIME LOST FOR REPAIRS, ETC.--BASED ON TELSMITH RUNNING TIME

East Unit:

5/3/41	Feed off at 12:30 PM & machinery stopped at 3:00 PM for 40 hours over week end.
5	5 Minutes, Starting mill after 5-shift shut down.
10	Feed off at 7:00 AM for 48 hours over week end.
12	10 Minutes, Starting mill after 6-shift shut down 5 min, & 6x12 drag overloaded 5 min.
14	10 Minutes, Examining Telsmith crusher.
16	1 Hour 20 Minutes, Changing oil in Telsmith, oil temperature high.
17	Feed off at 12:30 PM and machinery stopped at 3:00 PM for 40 hours over week end.
19	5 Minutes, Starting mill after 5-shift shut down.
20	2 Hours 20 Minutes, Oil leak at Telsmith 5 min. Auxiliary water pump switch burned out 2 hours 15 min.
23	2 Hours 10 Minutes, Power off 30 min. Washing out & starting mill 1 hr 40 min.
24	Feed off at 7:00 AM for 48 hrs over week end.
26	10 Minutes, Starting mill after 6-shift shutdown 5 min, 6x12 drag overloaded 5 min.
28	20 Minutes, 6x12 drag overloaded 15 min, setting up Gyrasphere 5 min.
29	2 Hours 30 Minutes, Feed cut off at 8:30 PM for 24-hr shutdown on Memorial Day.

Mr. C. E. Taylor---Mill Repairs & Changes---May 1941

5/30/41 24 Hours, Memorial Day. Feed on at 11:10 PM
10 Minutes, Starting up 5 min, 6x12 drag overloaded 5 min.
31 Feed off at 12:30 PM and machinery stopped at 3:00 PM for 40 hrs over week end.

WEST UNIT:

5/3/41 Feed off at 7:00 AM for 48 hours over week end.
5 5 Minutes, Starting up.
8 6x12 Marcy by-passed 1 hr working on shell liner bolts.
10 Feed off at 12:30 PM and machinery stopped at 3:00 PM for 40 hrs over week end.
12 5 Minutes, Starting up.
17 Feed off at 7:00 AM for 48 hrs over week end.
19 5 Minutes, Starting up.
20 2 Hours 15 Minutes, Auxiliary water pump switch burned out. Out of water.
23 2 Hours 20 Minutes, Power off 30 min, washing out & starting mill 1 hr 50 min.
24 Feed off at 12:30 PM and machinery stopped at 3:00 PM for 40 hrs over week end.
26 5 Minutes, Starting up.
28 5 " Setting up Gyrasphere.
29 2 Hours 30 Minutes, Feed off at 8:30 PM for holiday.
30 24 Hours, Memorial Day. Feed on at 11:10 PM.
31 Feed off at 7:00 AM for 48 hr shut down over week end.

Hardinge Mill:

5/3/41 12 Hours, week end shut down.
4 24 " ditto.
5 8 " 5 Minutes, ditto, and starting up.
7 By-passed 1 hour 15 minutes pumping dam.
10 10 Hours 30 Minutes, Week end shut down.
11 24 " Ditto.
12 8 " 30 Minutes, ditto & starting up.
17 10 " 30 " " .
18 24 " ditto
19 8 " 5 Minutes, ditto & starting up.
20 1 Hour 30 Minutes, Out of water. Auxiliary pump switch burned up.
23 2 " 10 " Power off 30 min, washing out & starting mill 2 hrs 10 min.
24 10 Hours 30 Minutes, Week end shut down.
25 24 " ditto.
26 8 " 5 minutes, ditto, & starting up.
28 1 " 5 " Repairing discharge pump belt 25 min, installing new coil in switch 40 min.
29 7 Hours 5 Minutes, Pumping out dam 1 hr 40 min. Repairing feed pump discharge pipe 2 hrs 55 min. Feed off for holiday 2 hrs 30 min.
30 24 Hours, Memorial Day.
31 10 " 40 Minutes, Feed on at 11:10 PM 5/30 & off at 12:30 PM 5/31 for week end.

(Signed) L. J. Weintz

Service file

COPY

July 22, 1941.

Mr. C. E. Taylor, Office.

Mill Repairs & Changes---June 1941

June 4. The Hardinge mill was shut down at 2:00 AM because of failure of feed pump motor. The motor burned up and was replaced by a spare 7½ HP motor. At the same time both feed and discharge pumps were overhauled.

June 5. The east Gyrasphere crusher passed a large piece of steel today. Oil temperature rose 5° and several hours later the crusher began making an odd noise and was shut down for inspection. The driven sheave was hot and was loose on the shaft and rubbing the crusher frame. It was moved back to place and the crusher ran without trouble.

June 10. The east Gyrasphere crusher choked today at 4:00 PM and when cleared made a loud noise so was dismantled for inspection. Several teeth were found torn out of the driven bevel gear. The pinion was damaged so it cannot be used again. Three bolts holding the countershaft assembly to the frame were broken off and had to be drilled out. The outer bronze sleeve was cracked, but was considered good for further service. The rubber wear protector on the deflector plate was half torn off. Installed the spare countershaft and eccentric. Cost of bevel pinion $83.00. Cost of bevel gear $157.10, plus $50.00 for installation on the eccentric. There will be no spare available till the broken gear is replaced on the spare eccentric by a new gear. For full protection for this condition a complete eccentric and gear assembly was ordered. The pinion installed was an alloy steel pinion made by Earle. The mantle appeared to be slightly loose on the head, but the open space (zinc filled) between the mantle and sphere head was still 1/4" though zinc was extruded from the pouring keys. Since the spare mantle is of the same kind (a worn mantle mounted 1/4" above the sphere head) it was decided to put back the same crushing parts so there would be no change in the crushing adjustment. The cause of this wreck in my opinion was the piece of steel that passed through the crusher on June 5. This ruptured the gear teeth, though none were actually torn out at the time, and they failed today because of weakened condition. This experience indicates the necessity of magnet protection for the Gyrasphere crushers recommended on December 21, 1940. The whole plant D.C. system is endangered by the operation of the defective Dings head pulley. The Dings, however, removes 20 to 40 lbs. per week of steel missed by the Ohio magnet, and if cut out of service the number of Gyrasphere wrecks such as this one today will be increased. The Telsmith crushers will pass steel missed by the Ohio in most cases; protection is needed for the Gyraspheres only.

June 11. The east Gyrasphere oil pipes were connected wrong after the repairs of yesterday, and operated intermittently during the night. The wrong connection was discovered and corrected the first thing this morning. The wrong connection resulted in the

countershaft ball bearings getting no oil. Piping should be checked before starting after an extensive repair of this kind.

June 14, West mill repairs. Installed a new feed dipper on the 6x12 Marcy, also installed a new feed end trunnion liner cemented in place with neat Lumnite cement grout. The liner had a left hand screw. Mr. Mesloh gives the cost and life data of the liner as follows:

"Feed Trunnion Liner: The feed trunnion liner removed 6/14/41 was installed 2/14/39. Life 28 months 0 days. It was purchased on order GB-2074, dated 9/9/37. It cost delivered $92.55.

"The liner installed 6/14/41 was purchased on order AGB-3615, dated 10/9/39. It cost delivered $93.57."

Changed oil in Telsmith crusher, used filtered oil, cleaned pipes and tank. Changed oil in Gyrasphere crusher. Cleaned out the screen and water pipes to 6x12 Micarta bearings. Shut Hardinge down for inspection, measured wear on feed end and discharge end trunnion liners. No change in discharge end in 6 months and 1/4" increase in diameter on the feed end in the same time. The feed end liner is still about 1/2" thick. Removed one link from each chain of the 6x12 drag, leaving 277 links with an average pitch of 4.268".

East mill repairs. Changed oil in 6x12 drag speed reducer. Washed out screen and water pipes to 6x12 Marcy Micarta bearings.

June 16. Oil pressure on the east Gyrasphere crusher was low at start up and the Mercoid switch would not allow the crusher to run. The oil pipes were opened and several 1/4" to 3/4" rocks were found in them partly choking the oil flow. After cleaning the pipes the oil pressure rose to normal 16 lbs. pressure (pressure before this was down to 5 lbs.). Rocks must have gotten into the pipe at the Gyrasphere repair on 6/11/41.

June 21, East mill repairs. Installed a new cam roller on the Zinc Dorr Bowl Classifier west rake. Removed one link from each chain of the 6x12 drag leaving 282 links with an average pitch of 4.221".

June 25. The east Gyrasphere crusher stopped crushing and when shut down the mantle was found to be loose on the sphere head; probably the result of passing steel on June 5. The spare mantle with 1/4" zinc between the bearing surfaces, the same as the one removed this time, was installed. Also installed 3/8" x 10" #1045 rubber to protect the deflector plate. Put in 2 new seal leathers. Mr. Mesloh gives the life and cost data of the Gyrasphere mantle as follows:

"Lower Mantle: #12 Lower Mantle, removed 6/25/41, was

installed 4/2/41. The mantle was removed as it was loose on the head, probably due to some steel which wrecked the crusher about 2 weeks ago. Life in service 2 months 23 days. Dry tons crushed 53,034. The mantle had seen previous service of 5 months 3 days, crushing 140,620 tons. Total life 7 months 26 days. Total tons crushed 193,654. Original cost of mantle $158.61. It was purchased on order GB-3204, dated 5/2/38. Cost per dry ton crushed $.00081904. The mantle, as last installed, had a 1/4" zinc shim between head and mantle rim. Mantle is not worn out and will be rezinced to the head with a 1/4" zinc shim.

"#9 Lower Mantle was installed 6/25/41. It was put on the head with a 1/4" zinc shim between head and mantle rim. The mantle has seen previous service of 6 months 27 days, crushing 170,422 dry tons. The mantle was purchased on order GB-1196, dated 3/23/37, and cost new $145.50."

June 28, West mill repairs. Repaired the west tailings pump, installed new casing, new impeller, new follower plate and new die ring. Installed new 1" x 8" #1045 rubber over the Telsmith crusher. Removed one link from each chain of the 6x12 drag leaving 276 links with an average pitch of 4.284". Installed a new crank pin on the east side of the Duplex Classifier (for short rod).

June 29, Mine crusher repairs. Installed 2 new liner plates in chute above the crusher and made monthly inspection of all parts of crusher.

Overhauled the auxiliary pump and motor in the mill. Connected duplicate starting equipment to avoid loss of time both mills when starting equipment fails. Dismantled motor and cleaned it. Dismantled the pump and installed a new shaft and impeller assembly with all brass sleeves and water rings new.

WEIGHTOMETER TESTS

	West		East
6/7	OK	6/7	.24% high
14	.24% high	14	No check
21	No check	21	1.00% low
28	.36% low	28	No check

Average screen analyses, feed to flotation:

East Unit: 2.9% on 48-mesh; 10.7% on 65-mesh; 22.5% on 100-mesh; 49.9% on 200-mesh; all cumulative.

West Unit: 2.3% on 48-mesh; 10.2% on 65-mesh; 22.3% on 100-mesh; 49.4% on 200-mesh; all cumulative.

Mr. C. E. Taylor---Mill Repairs & Changes----June 1941

POWER FOR GRINDING---KWH PER TON

	West	East	Total
Dry Tons Crushed	19026.9	18234.1	37261.0
Telsmiths	.232	.218	.225
Gyraspheres	.624	.670	.647
6x12 Marcys	3.190	3.164	3.177
Hardinge	.979	1.022	1.000
4x10 Marcys	3.375	3.468	3.422
TOTAL	8.400	8.542	8.471

WATER FOR FLOTATION

	Average	Maximum	Minimum
Turbidity	26	55	18
pH	7.5	7.6	7.4
Temperature, F.	78	82	74

Total rainfall 2.68". Maximum .83" on 6/23/41

Total days operating time 23-1/4.

TIME LOST FOR REPAIRS, BASED ON TELSMITH RUNNING TIME

East Unit:

6/1/41 Feed was off for week end shut down.
2 5 Minutes, Starting mill at 7:00 AM after 6 shifts shut down.
4 25 " 4x10 Marcys overloaded 20 min, 6x12 Marcys overloaded 5 min.
5 1 Hour 20 Minutes, Gyrasphere pulley slipped.
7 Feed off at 12:30 PM for week end.
9 5 Minutes, Starting mill at 7:00 AM after 5 shift shut down.
10 7 Hours 25 Minutes, 4x10 Marcy overloaded 10 min; repairing Gyrasphere crusher 7 hrs 15 min.
11 7 Hours 5 Minutes, Repairing Gyrasphere crusher & trouble with oil line.
14 Feed off at 12:30 PM for week end shut down.
16 2 Hours, Starting up after 5 shift shut down. Trouble with Gyrasphere oil pump.
17 5 Minutes, Working on Gyrasphere oil pump.
21 Feed off at 11:00 AM for week end.
23 10 Minutes, Starting up after 5 shift shut down 5 min, power interruption 5 min.
25 4 Hours 20 Minutes, Repairing Gyrasphere crusher, mantle loose 3 hrs 45 min, 6x12 drag classifier overloaded 15 min, 4x10 Marcys overloaded 10 min, opening up Gyrasphere 10 min.
28 Feed off at 12:30 PM for week end.
30 35 Minutes, Starting up, set collar loose on 6x12 Marcy shaft.

WEST UNIT:

6/1/41 Feed off for week end shut down.
~~4 12 Hours 55 Minutes, Feed pump motor burned up. Installed~~

Mr. C. E. Taylor---Mill Repairs & Changes----June 1941

COPY

6/2/41	5 Minutes, Starting up.
4	5 " 4x10 Marcys overloaded.
7	Feed off at 11:00 AM for week end.
9	5 Minutes, Starting up.
11	6x12 Marcy by-passed 35 min, bolt out.
12	5 Minutes, By-passing 6x12 Marcy. 6x12 Marcy by-passed 35 min tightening shell liner bolts.
14	Feed off at 7:00 AM for week end.
16	10 Minutes, Starting up.
18	6x12 by-passed 35 min tightening shell liner bolts.
19	6x12 by-passed 30 " " " " "
20	6x12 " " 20 " " " " "
21	Feed off at 12:30 PM. 6x12 by-passed 10 min tightening shell liner bolts.
23	10 Minutes, Starting up 5 min. Power interruption 5 min.
24	6x12 By-passed 30 min tightening shell liner bolts.
27	20 Minutes, by-passed 20 min tightening shell liner bolts.
28	Feed off at 11:00 AM for week end.
30	5 Minutes, Starting up.

Hardinge Mill:

6/1/41	Feed off for week end.
4	12 Hours 55 Minutes, Feed pump motor burned up. Installed 7½ HP 1150 motor with 6" motor pulley 10" pump pulley, speed 696 RPM. Power at start 2.63 HP.
7	Week end shut down.
9	5 Minutes, Starting up. Initial feed off 1 hr 55 min pumping dam.
14	Week end shut down.
16	5 Minutes, Starting up.
21	Week end shut down.
23	10 Minutes, Starting up.
28	Week end shut down.
30	25 Minutes, Starting up.

(Signed) L. J. Weintz

COPY

August 23, 1941.

Mr. C. E. Taylor, Office.

Mill Repairs & Changes---July 1941

July 4. The plant was idle from 11:00 PM July 3 till 11:00 PM July 4 for observance of Independence Day holiday.

July 5. Feed was cut off the east mill at 11:00 AM and off the west at 12:30 PM for week end. East mill repairs: tightened idlers on 6x12 drag chain. The Gyrasphere was not set up as power has been too high since replacement of parts on June 25.

The Hardinge mill was shut down for lining inspection and found OK. The Hardinge feed pump motor was changed back to 5 HP (removed 7½ HP). Installed one length of 4" flanged Ni-Hard pipe 6' long next to 4" ells in discharge line of Hardinge discharge pump.

July 9. Removed the worn out and rotted west #3 Zn Rougher Cell and started rebuilding a new cell in its place of 2" local white pine. The old cell was made of Georgia pine the sap of which rots more readily than white pine. We believe white pine a much more desirable lumber for this purpose; it works easier and lasts as long. The new cell was completed and filled with water on July 11 and was put back in service on July 14.

July 12. The west mill was shut down at 6:40 AM, out of ore. The east mill was out of ore till hoisting was started at 7:15 AM and then ran till 12:30 PM when feed was cut off for week end.

West Mill Repairs: Changed the dipper on #2 Marcy Mill, the old one being worn out; it was in service since 3/12/40. Installed a new feed screw to #1 Marcy; the one removed was in service since 10/11/40. The flights were not worn out, but were loose on shaft. The new screw was equipped with all Ni-Hard flights and 3½" turned and polished shaft; no holes bored through shaft to hold flights. The Jones speed reducer driving the zinc Dorr Bowl Classifier was opened for inspection and a new set of bronze bushings was checked with those in the reducer and were found correct and returned to the Supply House. The 6x12 Marcy was opened to inspect liners and to install new shell liner bolts. The liners were found to be 1½" thick at the center and 1" thick at the feed end and the discharge end of mill. Installed 12 special headed bolts after cutting bevel in the liners so the special bolts would fit and hold instead of pulling through as standard headed bolts do. A full set of these special headed bolts will be installed to avoid lost time from this cause.

July 15. Started dismantling the east zinc cleaner cell which is to be rebuilt. The east rougher froth was piped to the west zinc cleaner system which handled east and west rougher

froth successfully for several days while the cell was being changed. The new cell, made of 2" local white pine, was finished on July 19 and was filled with water on that day and put in service on July 21.

Started using hydrated lime at rate of about 2 lbs. per ton of feed in the east feed to Pb Rougher for the suppression of iron in the Pb concentrates. A dry feeder formerly used at the Old Mill was set up at the side of the Pb rougher. A new supply (2000 lbs.) of fresh hydrated lime was received on July 16, and its use was started at 3:00 PM.

July 19. Feed was cut off the east mill at 7:00 AM and off the west mill at 12:30 PM. East Mill repairs: Sorted the 6x12 Marcy rod charge and removed 13,150 lbs. of minus 2" rods. Put back 46 new 3" rods at 286.5 lbs., equals 13,179 lbs. The shell and head liners were found in good condition, but the feed end trunnion liner is about worn out, it should last 30 days longer. Installed a reconditioned plug door on the 6x12 Marcy. Installed 2 new 20" idlers near the head end of the 6x12 drag to hold down the lower chain and keep it from rubbing on the structural beam web through which the drag chain runs. When the drag is overloaded with coarse muck the chain rises and rubs the beam which results in a sharp rise in power.

West mill repairs: Installed 2 new 1/4" x 12" x 10" manganese steel skirts on the sides of the pan feeder over the Telsmith. Installed 2 new rubber bearings, water lubricated, on #1 feed screw. Removed one link from each chain of the 6x12 drag, leaving 275 links with an average pitch of 4.299".

On this day started again the Saturday evening repair shift which is made possible by S. P. Davidson being placed on salary basis.

July 26. Installed new babbitted bearings in the mine crusher motor. The motor was found to be loose on foundation. The ball bearing on the coupling side of the speed reducer high speed shaft had worked loose on the shaft and was replaced by a new bearing which fitted tightly to the shaft. Ball bearing #6224, removed, is good for further service in the same speed reducer in the position farthest from the motor where the load is not so heavy, was sent to Supply House. The bearing shell on the side next to the motor was shimmed up .004" and the motor legs were shimmed up .006" on one side to level it. When this work was completed the air gap was uniform .015" at all points between the rotor and stator. Before this it was not possible to get .005" shim between the rotor and stator at the bottom point.

West mill repairs: Installed Ni-Hard plates GB-370 and GB-371 on bottom and GB-372 and GB-374 on sides of chute from 6x12 drag to 4x10 Marcys at top of chute. Changed half of the pins in the 6x12 drag chain to shorten chain pitch. Used worn pins from yard which are better than those now in the chain. Put back 2 links in each chain, making 277 links with average pitch of 4.268". No.3

Mr. C. E. Taylor---Mill Repairs & Changes----July 1941

Marcy mill feed end trunnion liner was found to be worn out. It will be kept in service till the head begins to show wear. The head is cracked and is to be discarded when the liner is replaced.

WEIGHTOMETER TESTS

West		East	
7/5	No check	7/5	1.30% low
12	.74% low	12	.78% high
19	No check	19	.48% high
26	.87% high	26	.42% low

Average screen analyses, feed to flotation:

East Unit: 2.5% on 48-mesh; 9.5% on 65-mesh; 21.3% on 100-mesh; 48.8% on 200-mesh; all cumulative.

West Unit: 2.0% on 48-mesh; 9.3% on 65-mesh; 21.0% on 100-mesh; 48.7% on 200-mesh; all cumulative.

POWER FOR GRINDING---KWH PER TON

	West	East	Total
Dry Tons Crushed	19995.0	20022.5	40017.5
Telsmiths	.237	.203	.220
Gyraspheres	.676	.698	.687
6x12 Marcys	3.261	3.171	3.216
Hardinge Mill	1.018	1.017	1.017
4x10 Marcys	3.417	3.441	3.429
TOTAL	8.609	8.530	8.569

WATER FOR FLOTATION

	Average	Maximum	Minimum
Turbidity	167	800	28
pH	7.3	7.5	7.2
Temperature, F.	80.5	86	76

Total rainfall 6.22". Maximum 1.34" on 7/23/41.

Total days operating time 22-2/3 days.

TIME LOST FOR REPAIRS, BASED ON TELSMITH RUNNING TIME

East Unit:

7/1/41 35 Minutes, Power interruption & 6x12 drag hung.

Mr. C. E. Taylor---Mill Repairs & Changes----July 1941

COPY

7/2/41 5 Minutes, Power interruption & Telsmith crusher choked.
3 2 Hours 30 Minutes, Feed off at 8:30 PM for holiday.
4. 24 " , Independence Day holiday.
5 5 Minutes, Starting up after holiday. Feed off at 11:00 AM for week end shut down.
7 5 Minutes, Starting up after week end shut down.
10 3 Hours 5 Minutes, Changing Telsmith crusher oil pump.
11 Feed off for week end at 12:30 PM.
14 5 Minutes, Starting up.
17 10 " Setting up Gyrasphere.
19 Feed off at 7:00 AM for repairs & week end.
21 5 Minutes, Starting up.
23 6x12 Marcy by-passed 1 hr 55 min tightening dipper.
24 5 Minutes, Power interruption, crusher choked.
26 Feed off at 12:30 PM for week end.
28 5 Minutes, Starting up.
30 15 " Power off 5 min. Setting up Gyrasphere 10 min.

West Unit:

7/1/41 30 Minutes, Power interruption, Gyrasphere choked.
2 5 " " " Telsmith "
3 2 Hours 30 Minutes, Feed off at 8:30 PM for holiday.
4 24 " Independence Day, holiday.
5 5 Minutes, Starting up at 11:00 PM. Feed off at 12:30 PM for week end.
7 5 Minutes, Starting up.
12 45 " Out of ore. Feed off at 7:45 for repairs & week end shut down.
14 5 Minutes, Starting up.
16 10 " Chute under Telsmith choked.
19 Feed off at 12:30 PM for week end.
21 10 Minutes, Starting up.
24 #1 Marcy down 5 Hrs 20 Min hot motor bearing.
25 40 Minutes, Broken chain on 6x12 drag. 6x12 Marcy by-passed 50 min, shell liner bolt.
26 Feed off at 7:00 AM for repairs & week end shut down.
28 5 Minutes, Starting up.
29 4x10 Marcys by-passed 1 Hr flight loose on feed screw.
30 5 Minutes, Power off.
31 6x12 Marcy by-passed 30 min, shell liner bolts.

HARDINGE MILL:

7/1/41 1 Hour 10 Minutes, Repairing hole in discharge pipe from Hardinge mill discharge pump.
3 Initial feed off 2 hrs pumping dam.
4 Feed off for week end.
7 5 Minutes, Starting up.
12 Feed off for week end.
14 5 Minutes, Starting up.
19 Feed off for week end.
21 10 Minutes, Starting up.
26 Feed off for week end.
28 5 Minutes, Starting up.
30 5 " Power off.

(Signed) L. J. Weintz

COPY

September 26, 1941

Mr. C. E. Taylor, Office

Mill Repairs & Changes--August 1941

August 2, East mill repairs: Relined the chute from the 6x12 drag classifier to the 6x12 Marcy Mill with Ni-Hard liners. A full set of bottom liners consisting of one GB-331, three GB-303 and one GB-336 liners were installed. The side liners were all good for further use, except one, when turned around and placed with the good side on bottom. One side liner GB-304 was replaced with a new one. The bottom liners were installed on June 5, 1940; side liners were installed in June 1939. Inspected feed end trunnion liners in 4x10 Marcy Mills and found #3 worn out. This liner will be kept in service till the head is further worn; the head is cracked and is to be discarded when removed.

West mill repairs: Changed oil in Telsmith crusher, used filtered oil, cleaned pipes and tank. Changed oil in the Gyrasphere crusher, used new Altair oil. Installed special shell liner bolts in the 6x12 Marcy shell liners. The liners are worn and bolts pull through, causing lost time. New countersinks were cut with the oxy-acetylene torch and installed a full set of broad headed shell liner bolts. Changed pins in the 6x12 drag chain, removed badly worn ones and put in some not so badly worn. As a result of this, had to add one link to each chain, making 278 links with an average pitch of 4.253".

August 5, Washed out #1 Pb Dorr Tank for inspection. A twisted and broken length of 1/2" pipe was removed from around the rakes. The 6" pipe under the tank was half full of coarse muck and was washed out. The rake blades were only 15" long and 1-3/4" deep, so were replaced by a new set of channel arms with new blades 24" long and 2-1/2" deep. Hereafter #1 Pb and Zn Dorr Tanks, E and W, will be pumped out for inspection and cleaning every year, and the #2 Pb and Zn Dorr Tanks, E and W, will be pumped out for inspection and cleaning every two years.

August 7, The gunite tops of the east and west crude ore bins were found to be in bad condition. Gunite as originally placed was too thin in places (1" thick) and water got through and rusted out the 1/8" sheet iron top and the steelcrete reinforcing in the gunite. The 8", ~~I~~ columns supporting the Rock House where they pass through the gunite top were badly rusted. The steel columns were cleaned and painted and were encased in concrete from the top of concrete casing inside of bins to the top of gunite outside of bins. Asphalt roofing dope made of #16 Apkote and asbestos was then smeared around the joint between steel and concrete to keep water out. The same roofing dope was used on all cracks in gunite to keep out water and to prevent further rusting of tanks. To replace or repair the gunite tops will be an expensive job and no particular harm will be done if they fall in. Men are not required to go out onto tops except at a time like this when the leaks

were stopped and then proper precautions are taken to protect them.

August 8, The west 6x12 Marcy was shut down to weld a crack in the shell. The crack was at the discharge end where the 3/4" shell plate joins the cast steel flange. The crack was gouged out with the oxy-acetylene welder and was arc welded.

August 9, Feed was cut off the west mill at 11:00 AM and the east mill at 12:30 PM.

West mill repairs: Finished changing pins in the 6x12 drag chains, no links were added. Removed the west tailings pump motor for overhauling and cleaning, and installed a 35 HP spare motor, 1155 RPM, with 9-1/2" motor pulley and 10" pump pulley.

East mill repairs: Removed one link from each chain of the 6x12 drag classifier, leaving 281 links with an average pitch of 4.236". Installed one used Dayton Cog Belt on the Gyrasphere drive, replacing one broken a few days ago. Installed a new RC106 chain on the weightometer conveyor belt drive from speed reducer to head of conveyor.

August 11, Pumped out the east #2 Pb Dorr Tank for inspection and cleaning. There was no trouble with the tank, but it had not been pumped out since 1932. A large quantity of scrap iron, bolts, tools, etc., dropped into the tank was found in the bottom of the tank at center. Rake blades were 24" long by 3" deep. The overflow of E #1 Pb Dorr Tank was by-passed to the west side through the 6" connecting pipe.

August 12, Pumped out the west #2 Pb Dorr Tank for inspection and cleaning. It has not been inspected since 1936. The drain valve, a 4" screwed gate valve, was broken and could not be used for draining the tank. It was replaced by a new 4" Merco plug cock. There was no junk in the bottom. Rakes were in good condition; blades were 24" long by 3" deep.

August 13, Pumped out the east #2 Zn Dorr Tank for inspection and cleaning. Nothing found in bottom. Rakes were levelled and tightened. Blades were 24" long by 3" deep. Drained #2 Zn Dorr Tank on west side for inspection and cleaning. Adjusted rakes and tightened them. Rakes were 24" long by 3" deep.

August 16, Feed was cut off the east mill at 9:00 AM and off the west at 12:30 PM.

East Mill Repairs: Installed a new brush holder casting on the 6x12 Marcy Fynn Weichsel motor (weight 16 pounds, cost $60.00). The old one was cracked, had been welded and cracked again. Installed one used Dayton Cog Belt on the 6x12 Marcy drive, replacing a split belt (there are 6 more used belts on hand, and a new set in supplies). Repaired the east rakes of the Duplex Classifier; arc welded the brace to channel irons at rear end.

Mr. C. E. Taylor---Mill Repairs & Changes----August 1941

West Mill Repairs: Opened the Hardinge Mill for inspection and found 4 holes in the feed end conical section of lining. One hole was 12" diameter and the others 3" diameter. The holes were patched with Ni-Hard blocks set in Lumnite cement and wedged in place with steel wedges. 5 Ni-Hard blocks were used in the large hole and one in one of the smaller holes. The N. C. granite patch put in the lining near the door several months ago is still holding and apparently does not wear any faster than the Danish Flint Pebbles. Ni-Hard blocks will be the preferred lining material if available; it may be impossible to get nickel to make Ni-Hard in the future. We have one more lining to put in of pebbles and pebble scraps before a substitute lining will have to be found. Removed one link from each chain of the 6x12 drag classifier, leaving 277 links with an average pitch of 4.268".

August 18, The east #1 Zn Dorr Tank was pumped out for inspection and cleaning. Nothing was found in pipes and rakes did not need adjusting. Blades were 24" by 3". While this tank was out of service three tanks were used to handle the east and west Zn fines. The east Zn Dorr Bowl overflow was by-passed to the east #2 Dorr Tank and the overflow of this tank went by launder to the Zn sump pump and to the west #1 Zn Dorr Tank.

August 20, The east 6x12 drag chain broke twice today (west chain). This chain has been in operation since January 1940 and these are the first links to break.

August 22, The east Gyrasphere crusher was set up 6 lugs today, 4 yesterday and 4 the day before that. The mantle in this crusher is raised 1/4" above the sphere head and zinc backing is probably being forced out of the 1/4" space around the bottom.

August 23, Feed was cut off the west mill at 11:00 PM and off the east mill at 12:30 PM.

West Mill Repairs: Removed the spare 35 HP west tailings pump motor and put back the original 30 HP motor which had been cleaned, dried and varnished and which was equipped with new babbitted bearings. Opened the Hardinge mill to inspect the lining and found the Ni-Hard blocks all tight. There was one new hole 1" diameter but it was not patched.

East Mill Repairs: The Gyrasphere crusher was dismantled and the mantle was found loose on the head and nearly all the zinc backing was gone, as had been expected. The spare mantle was also a used mantle raised 1/4" above the sphere head, but with the addition of a 1/4" x 1" steel band around the bottom of the mantle welded to the sphere head apron to close the 1/4" gap between the sphere head and mantle and prevent zinc from falling or squeezing out. One new seal leather was put in. The oil was not changed. The crusher was set with 5 set-up lines showing and gaged 1/4" at the closest place. Mr. Barnard gives the life and cost data of the Gyrasphere crusher parts:

Mr. C. E. Taylor---Mill Repairs & Changes----August 1941

"The lower mantle (#9) removed from 1-E Gyrasphere 8/23/41 was installed 6/25/41. It was installed with 1/4" of zinc between the mantle and the head. It was removed because this zinc was forced out, loosening the mantle.

"Mantle #12, the spare mantle, was installed 8/23/41 with 1/4" zinc between the mantle and the head. To prevent the zinc from coming out, pieces of 1/4" x 1" strap iron were welded to the bottom of the sphere head so as to cover the gap.

"#9 mantle removed 8/23/41 had seen previous service of 6 months 27 days, during which time it had crushed 170,422 tons. Since its installation 6/25/41 to 8/23/41, or 1 month 13 days, it has crushed 38,495 tons, so that the total crushing time for this mantle has been 8 months 10 days, during which time it has crushed 208,917 tons, at a cost of $.000696 per ton of ore.

"#12 mantle installed 8/23/41 has seen previous service of 7 months 26 days, during which time it has crushed 193,654 tons, at a cost of $.000819 per ton."

August 25, Pumped out the west #1 Zn Dorr Tank for inspection and cleaning. Junk was cleaned out of the bottom and rakes were checked for tightness and trueness. Blades were 24" long by 3" deep. While the tank was out of service 3 tanks were used to handle the east and west zinc fines. The west Zn Dorr Bowl Classifier overflow was by-passed to the west #2 Dorr Tank, and the overflow of this tank went to the zinc sump pump and by a temporary pipe to the east Zn #2 Dorr Tank.

August 30, Feed was cut off the east mill at 7:00 AM and off the west at 12:30 PM. The Hardinge Mill was shut down at 7:00 AM to inspect lining and was started again after the lining was found to be in good condition.

East Mill Repairs: Installed a new spare, simplified, inner Ryertex bearing sleeve in the Telsmith crusher. Both inner and outer sleeves are now of the new simplified design (see report to Purchasing Department dated September 26, 1941). The original sleeves will be held as spares; they are about half worn out. They will be examined every 6 months to determine if there is any deterioration or warping of the Ryertex material. The oil sleeve was removed and trued up in the lathe and then was put back. There were no spare oil sleeves on hand. We have parts that can be reconditioned for our future needs. Changed oil in the Telsmith, put in a charge of new Nabob machine oil. Cleaned the pipes and tank. Installed a new feed dipper on #4 Marcy mill equipped with Ni-Hard flights and with 3-1/4" hot rolled shaft. Two new water lubricated rubber bearings were installed on the screw. All feed screws are now equipped with rubber bearings.

West Mill Repairs: Removed one link from each chain of the 6x12

drag classifier, leaving 276 links with an average pitch of 4.284". Installed a 1/2" water pipe from the bottom of the auxiliary tank to a new Mercoid controller which will act as a low water alarm by blowing a horn and lighting a red light when water in tank reaches the 12" level (above bottom). This is for the protection of 6x12 Micarta bearings, the tailings line to the bottom and the Sullivan Compressors, all of which are served by the auxiliary pump and tank.

WEIGHTOMETER TESTS

West		East	
8/2/41	.97% low	8/2/41	.109% low
9	OK	9	No Check
16	No Check	16	OK
23	OK	23	No Check
30	No Check	30	.33% high

Average screen analysis, feed to flotation:

East Unit: 2.2% on 48-mesh; 9.2% on 65-mesh; 20.1% on 100-mesh; 49.2% on 200-mesh; all cumulative.

West Unit: 3.0% on 48-mesh; 10.5% on 65-mesh; 21.6% on 100-mesh; 50.2% on 200-mesh; all cumulative.

POWER FOR GRINDING--KWH PER TON

	West	East	Total
Dry Tons Crushed	20053.7	19459.0	39512.7
Telsmiths	.235	.199	.217
Gyraspheres	.679	.639	.659
6x12 Marcys	3.321	3.237	3.279
Hardinge Mill	1.036	1.068	1.052
4x10 Marcys	3.529	3.581	3.555
TOTAL	8.800	8.724	8.762

WATER FOR FLOTATION

	Average	Maximum	Minimum
Turbidity	33	60	22
pH	7.4	7.7	7.3
Temperature, F.	76	85	60

Maximum rainfall .54" 8/12/41
Total rainfall 1.72"

Total operating time 22-1/3 days

TIME LOST FOR REPAIRS, BASED ON TELSMITH RUNNING TIME

East Unit:

8/2/41 Feed off at 7:00 AM for repairs & week end shut down.

Mr. C. E. Taylor----Mill Repairs & Changes-----August 1941

COPY

8/4/41 5 Minutes, Starting up. 6x12 Marcy by-passed 8 hrs 15 min installing new elevator wheel & feed chute which were torn up by clean up man's shovel becoming hung in wheel.
7 6x12 Marcy lost 25 min by motor kicking off twice.
9 Feed off at 12:30 PM for week end.
11 5 Minutes, Starting up.
14 5 " Chute under Telsmith choked.
15 5 " Ditto
16 Feed off at 9:00 AM for repairs & week end.
18 5 Minutes, Starting up.
20 1 Hour 30 Minutes, West chain on 6x12 drag broken. Set up Gyrasphere.
21 15 Minutes, set up Gyrasphere.
22 15 " Ditto
23 Feed off at 12:30 PM for repairs & week end.
25 20 Minutes, Starting up 5 min, opening Gyrasphere crusher 15 min.
27 5 Minutes, Power interruption.
30 Feed off at 7:00 AM for repairs & week end.

West Unit:

8/2/41 Feed off at 12:30 PM for week end.
4 5 Minutes, Starting up.
6 35 Minutes, fine wet muck caused Gyrasphere crusher oil temperature to rise to 170° F. Opened crusher 3 lugs & started use of radiator for cooling oil.
8 35 Minutes, Digging muck out from under Telsmith crusher. 6x12 Marcy by-passed 3 hrs welding crack in shell.
9 Feed off at 11:00 AM for repairs & week end.
11 5 Minutes, Starting up.
16 Feed off at 12:30 PM for week end.
18 5 Minutes, Starting up.
19 5 " Feed chute to #2 Marcy choked.
20 #1 Marcy by-passed 20 min shell liner bolt out.
23 Feed off at 11:00 AM for repairs & week end.
25 5 Minutes, Starting up.
26 #1 Marcy by-passed 15 min shell liner bolt out.
27 35 Minutes, Power interruption 5 min, pan feeder drive belt broken 30 min, #2 Marcy by-passed 30 min shell liner bolt out.
30 Feed off at 12:30 PM for week end.

HARDINGE MILL:

8/1/41 By-passed 1 Hour 50 Minutes, pumping out dam.
2 Feed off at 12:30 PM for week end.
4 5 Minutes, Starting up.
9 Feed off at 12:30 PM for week end.
11 5 Minutes, Starting up.
12 2 Hours 35 Minutes, Patching hole in dipper.
16 Feed off at 12:30 PM for week end.
18 5 Minutes, Starting up.
19 30 " Discharge pump drive belt broken.

Mr. C. E. Taylor----Mill Repairs & Changes-----August 1941

8/23/41	Feed off at 12:30 PM for week end.
25	5 Minutes, Starting up.
27	5 " Power interruption.
30	Feed off at 12:30 PM for week end.

(Signed) L. J. Weintz

COPY

October 17, 1941.

Mr. C. E. Taylor, Office.

Mill Repairs & Changes in September

September 1. Labor Day was observed as a holiday and only mill caretakers were on duty in the mill, one on each shift. Because of shortage of ore in the mine, the mill was not started at 11:00 PM 9/1/41. Feed was started at 7:05 AM 9/2/41.

September 2. Pumped out and drained #1 Pb Dorr Tank in the West mill for cleaning and inspection. A large amount of scrap was found in the bottom of the tank and in the 6" pipe. Blades on rakes were 3" x 24", except four at the end of each long rake arm which had been extended by welding 5" on the ends of blades to make blades 29" long. Future rake blades should be set to stagger so as to clean up the bottom at each revolution.

September 3. The east Telsmith crusher ran hot because of new inner Ryertex bearing installed 8/30/41 and coarse ore. Feed was reduced on the 11-7 shift and oil temperature then dropped.

September 6. Feed was cut off the west mill at 7:00 AM and the east at 12:30 PM. The Hardinge mill lining was inspected and one hole 1" diameter was found at the feed end. All Ni-Hard patch blocks were in place and tight.

West Mill Repairs: Changed oil in the 6x12 Drag Classifier Philadelphia Gear Speed Reducer (3 months). The 6x12 Marcy trunnion bearing was drilled so oil applied at shut down time entered the center of the bearing. Installed a new Link-Belt #160 roller chain, 2" pitch, on the 6x12 drag classifier drive. #1 Nash Hytor was disconnected, leaving 3 Nashes in service to provide flotation air.

Removed half of the 6x12 Marcy rod charge, reversed ends and put them back. This was done to level the rod charge in the mill. Rods always wear faster at the feed end, so rod charge stands higher in the mill at the discharge end. We suspect the capacity falls off because of this. The practice has been to remove minus 2" rods at 3 months intervals to maintain grinding capacity. Shipment of 3" rods ordered by us early this year has been delayed and we are about to run out of them. To make rods last we have stopped removing minus 2" rods and will adjust rods for level from time to time.

East Mill Repairs: Changed oil in the 6x12 drag classifier speed reducer (3 months). Bored the cross piece in the feed end trunnion bearing of the 6x12 Marcy to put oil in the center of bearing when shutting down.

September 10. Received a carload of sodium silicate from Jeffersonville, Indiana, the same as the last car furnished. Silicate was formerly furnished by the Chester, Pennsylvania, plant

Mr. C. E. Taylor----Mill Repairs & Changes in September 1941

of The Philadelphia Quartz Company, but due to war conditions they are unable to ship any longer from this plant and will continue to ship from Jeffersonville. The Jeffersonville lumps are much larger ($5\frac{1}{2}$" x $5\frac{1}{2}$" and 1922 grams) than the Chester lumps (3" x 3" and 174 grams), and do not dissolve as readily. The reagent man has the impression that his usage of silicate has gone up since the change was made, but we can find no facts so far to bear him out.

Steel building columns where they pass through the gunite top of the east crude ore bin were cemented up and the joints were made water tight with emulsified asphalt.

September 13. The east mill was shut down at 7:00 AM and the west at 12:30 PM.

East Mill Repairs: Removed 77 small rods from the 6x12 Marcy, reversed ends and put them back to level the charge.

West Mill Repairs: Removed one link from each chain of the 6x12 drag classifier, leaving 275 links with an average pitch of 4.299".

September 18. Installed a pair of new bevel gears in the drive to the 36" conveyor belt in the Rock House; 16 T pinion and 92 T driven gear. The 92 T gear removed is cast iron and was cracked in service. We were afraid to weld it, so bought a set of spares. The cracked gear was later preheated and welded with bronze rod and the oxy-acetylene torch. It will be kept as a spare.

September 20. The west mill was shut down at 7:00 AM and the east at 12:30 PM. The Hardinge mill was shut down at 7:00 AM for lining inspection, and 3 holes were found in the feed end lining. These were patched with one Ni-Hard block in each hole.

West Mill Repairs: Several badly worn links and pins were removed from the 6x12 drag chain and were replaced by used links in better condition. It was necessary to put back one link in each chain, making 276 links with an average pitch of 4.284". Removed 1/4 of the rod charges in #1 and #2 4x10 Marcys and reversed ends to level the rod charges in the mill for better grinding.

September 21. Installed 2 new steel chute liner plates CP1 and CP2, shown on drawing 7GB-299, in the chute above the mine crusher.

September 24. Removed #3 East Zn Rougher cell and installed a new cell made of local white pine with emulsified asphalt in all joints. The carpenters worked 2 shifts, September 24 and September 25, and completed the cell on September 26.

September 27. The east mill was shut down at 7:00 AM and the west at 12:30 PM.

Mr. C. E. Taylor----Mill Repairs & Changes in September 1941

East Mill Repairs: Removed three 4-3/16" pitch cast iron sprocket rims from the head sprockets of the 6x12 drag classifier. They were about worn out, though still running without trouble; they were installed new on January 29, 1941. Installed 3 new #1045 flame hardened steel sprocket rims with teeth at 4-5/16" pitch. The east sprocket was loose on the shaft and was wedged tight with steel shims. When the drag was started there was a tendency toward the chain climbing the sprocket teeth. The average calculated pitch of the chain links is 4.25", which is too short for the 4.31" pitch of teeth, and probably accounts for climbing of the chain. Installed new 20 T and 81 T driving sprockets and a new 1" pitch roller chain on the pan feeder drive.

West Mill Repairs: Changed oil in the Telsmith Crusher, cleaned pipes and tank, used filtered oil. Changed oil in the Cyrasphere Crusher, used new Altair oil. Installed a new 4" pipe from the rake discharge end of the top tailing drag classifier to the plunging box near the Hardinge Mill motor. Removed one link from each chain of the 6x12 drag classifier, leaving 275 links with an average pitch of 4.299". Examined the shell linings of all 4x10 Marcy mills; #1, #2 and #3 shell liners were found about worn out, #4 are about half worn out. #2 liners and #4 liners are new style which extend from head to head; #1 and #3 are old style which extend from head liner to head liner. One of the shell liners in #3 Marcy has a hole worn through it and it will be necessary to install the 1½" x 7" lifter bars to hold the bolts and shell liners in this mill in place. We have two sets of shell liners on hand, both new style. One set is entirely of manganese steel and the other is made up of 16 Ni-Hard liners (cast by Palmerton) and 4 partly worn manganese liners. It was decided to order 2 sets of manganese steel shell liners and one set of manganese steel head liners at once.

A low water alarm on the auxiliary tank was put in service today. It consists of a Mercoid controller connected by a 1/2" pipe from the bottom of the auxiliary tank which transmits the tank head to the switch. When water in the tank drops to a predetermined level (12" above bottom) the switch operates a horn and lights a red light. When water rises to 18" above the bottom the Mercoid switch cuts off power to the red light and horn. The present float switch starts the pump when the water level drops to 24" above the bottom of the tank. This arrangement is for the protection of the Micarta bearings in the 6x12 Marcys, the Sullivan Air Compressors and against choking the tailings line to the Bottom.

September 28. Installed a large cast steel chute liner plate #54 (43" x 54" x 1-1/2", shown on drawing 7GB-299). Future plates will be made of 1-1/2" #1045 steel flame hardened on wearing surfaces. Cast steel costs about 10¢ per pound, and #1045 about 5¢. Drilling and flame hardening will bring the cost of liners to approximately the same as cast steel plates, but they will wear better. Flame hardening increases the hardness from 30 to 80 Sclerescope hardness.

Mr. C. E. Taylor----Mill Repairs & Changes in September 1941

September 30. The use of filtered oil in the mill has resulted in a considerable saving. The former average consumption of new Nabob oil was 18 barrels per month; it is now 5 barrels per month. Filtered oil is used in the West Telsmith for oil changes and for make-up, in all 4x10 Marcy trunnion bearings and Hardinge mill trunnion bearings, and in all Borcherdt and Wilfley pumps. New Nabob oil is used in the east Telsmith Crusher for oil changes and make-up (Ryertex bearings), in all motors and Jones Speed Reducers and in all ring oil bearings. A system of settling the filtered oil is successful in removing all foreign matter from the oil that has passed the filter, and to all appearances the used filtered oil is perfectly safe to use in the places named above.

WEIGHTOMETER TESTS

	West		East
9/6/41	OK	9/6/41	No Check
13	No Check	13	1.27% Low
20	1.32% High	20	No Check
27	No Check	27	.35% High

Average screen analyses, feed to flotation:

East Unit: 2.8% on 48-mesh; 10.3% on 65-Mesh; 21.8% on 100-mesh; 50.2% on 200-mesh; all cumulative.

West Unit: 2.9% on 48-mesh; 10.9% on 65-Mesh; 22.4% on 100-mesh; 50.6% on 200-mesh; all cumulative.

POWER FOR GRINDING---KWH PER TON

	West	East	Total
Dry Tons Crushed	19017.9	18872.6	37890.5
Telsmiths	.221	.202	.211
Gyraspheres	.658	.649	.654
6x12 Marcys	3.213	3.127	3.170
Hardinge Mill	1.037	1.045	1.041
4x10 Marcys	3.370	3.414	3.392
TOTAL	8.499	8.437	8.468

WATER FOR FLOTATION

	Average	Maximum	Minimum
Turbidity	27	45	12
pH	7.5	7.6	7.3
Temperature, F.	76	82	71

Total Rainfall 1.52" Maximum .66" 9/2/41

Total days operating time 21-1/3 days

Mr. C. E. Taylor----Mill Repairs & Changes in September 1941

TIME LOST FOR REPAIRS BASED ON TELSMITH RUNNING TIME

East Unit:

9/2/41	15 Minutes, Starting up after Labor Day, 5 min, power interruption, Telsmith crusher choked.
3	5 Minutes, Gyrasphere crusher motor kicked off.
6	Feed off at 12:30 PM for week end.
8	10 Minutes, Starting up.
13	Feed off at 7:00 AM for repairs & for week end.
15	5 Minutes, Starting up.
20	Feed off at 12:30 PM for week end.
22	5 Minutes, Starting up.
24	10 Minutes, Tightening pulley on Telsmith jack shaft.
26	20 " Ditto.
27	Feed off at 7:00 AM for repairs and for week end.
29	25 Minutes, Starting up 5 min, Set collar loose on 6x12 drag classifier 20 min.

West Unit:

9/2/41	10 Minutes, Starting up 5 min, power interruption, Telsmith crusher choked 5 min.
3	5 Minutes, Telsmith crusher motor kicked off.
6	Feed off at 7:00 AM for repairs & for week end.
8	10 Minutes, Starting up.
10	20 " Pan feeder hung.
13	Feed off at 12:30 PM for week end.
15	5 Minutes, Starting up.
17	6x12 Marcy motor kicked off, no lost time.
20	Feed off at 7:00 AM for repairs & for week end.
22	5 Minutes, Starting up.
27	Feed off at 12:30 PM for week end.
29	5 Minutes, Starting up.

HARDINGE MILL:

9/2/41	5 Minutes, Starting up.
3	Initial feed off 1 hr 15 min pumping dam.
6	2 Hours, Inspecting lining.
8	10 Minutes, Starting up.
11	15 " Patching hole in Hardinge feed pump casing.
13	2 Hours, Inspecting lining.
15	30 Minutes, Starting up.
17	4 Hours 30 Minutes, Repairing Hardinge discharge pump.
20	3 Hours 35 Minutes, Patching holes in lining.
22	45 Minutes, Starting up.
24	45 " Packing Hardinge discharge pump.
27	1 Hour 45 Minutes, Inspecting lining.
29	5 Minutes, Starting up.

(Signed) L. J. Weintz

COPY

November 21, 1941.

Mr. C. E. Taylor, Office.

Mill Repairs & Changes in October

October 4, West Mill Repairs: Inspected 6x12 Marcy shell liners and estimated they would be good for 6 months longer. The Gyrasphere crusher was set up all the way to determine remaining adjustment---35 lugs. Wearing parts will have to be changed in about one month. Installed 15 tee headed shell liner bolts in #1 Marcy. Liners are about worn out and bolts pull through. Both #1 and #2 Marcy in the west mill and #3 in the east mill are in this condition. Welded 1-1/2" diameter rod to the outside edge of one discharge head liner in #2 Marcy to protect head against wear.

East Mill Repairs: An attempt was made to line up the head sprockets of the 6x12 drag classifier, but this had to be postponed till next week because of lack of time and mechanics. Installed 19 lifter bars (originally 1-1/4" x 7", but now much thinner as they have been used several times) on the #3 Marcy mill shell liners to prevent shell liner bolts from pulling through. Concreted around 4" outlet pipe from the Pb Rougher launder to #2 Pb pump to stop leak and as wear protection; used Lumnite cement grout 1:1. This is a successful method for the stoppage of leaks and to take wear of muck in pipes, especially at bends.

October 6, received 45,440 pounds of 3" rods for 6x12 Marcys. Our stock would have been exhausted if we had followed our usual practice of removing minus 2" rods every 3 months; instead of this we reversed a sufficient number of worn rods in the mill to keep the charge approximately level in the mill. Rods always wear faster at the feed end in these mills. The order called for 60,000 pounds; they will ship 15,000 pounds later; order AGB-6475; weight per rod 291.3 pounds.

October 9, the east 6x12 drag chain started climbing teeth on the east head sprocket because the sprocket had come loose on the head shaft. The sprocket teeth were lined with teeth on other sprockets and the hub was arc welded to the shaft at both hub faces.

October 11, East Mill Repairs: Removed 6820 pounds of minus 1-1/2" rods from the 6x12 Marcy and put back 29 new 3" rods, 8323 pounds. Installed four 3/4" bolts and pipe spacers through the 3 head sprockets on the 6x12 drag classifier to hold them more securely in line. Installed a new S160, 2" pitch roller chain 19' long on the 6x12 drag drive; the old chain hung on sprocket teeth and broke several links in the drive chain. Removed one feed end and one discharge end liner from the 6x12 Marcy to inspect packing at end of shell liners. It was in place and the heads were protected.

West Mill Repairs: Removed one link from each chain of the 6x12 drag, leaving 274 links with an average pitch of 4.315". Inspected Hardinge lining, no holes.

Mr. C. E. Taylor----Mill Repairs & Changes in October 1941

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Installed a new 36" 6-ply Master Brand, Manhattan Rubber Company belt, 138' long, on the conveyor to the west ore bin in the Rock House. 147' of belt was received, 139' ordered. 9' of new belt will be held for emergencies to splice into the new belt. Also the belt removed which has some good parts will be kept as long as possible for emergencies. Flexco #1-1/2 belt fasteners were used to couple the new belt together. Mr. Barnard gives the life and cost data:

"On October 11, 1941, the conveyor belt from the pan feeder to the west side ore bin was removed. It was a Manhattan Rubber Company 'Super-Master Brand', 139' long, 36" wide, 6-ply, 32-ounce duck, 1/8" top cover, 1/16" bottom cover. It was purchased on order GB-5706, dated April 18, 1934, and cost $562.59, or $4.047 per foot.

"It had been installed August 21, 1935, and when removed had given a life of 6 years, 1 month, 19 days, during which time it had carried 3,476,109 tons at a cost per ton of $.0001618.

"The belt previous to this one, installed when the mill was started, had given a life of 7 years 10 months, and cost $725.13. It carried 2,027,502 tons, or $.0003576 per ton.

"A splice was made in the belt removed on December 5, 1940, at which time the worst part of the original belt was replaced.

"The belt installed October 11, 1941, has the same specifications as the one taken off, but is the Manhattan Rubber Company 'Master Brand'. It was purchased on order AGB-7060, dated 6/26/41. It cost delivered $753.30, or $5.42 per foot.

"The total tonnage mined from October 20, 1927, to August 21, 1935, was 3,146,134. This represents the tonnage carried by the first 36" belts. E & W belts were used eventually on the conveyor to the west bin."

The old belt measured 139' 10-1/2". It had clusters of small wires 1" long from wire rope in the mine at intervals of about a foot throughout its length in a straight line 14" from the east edge of the belt. Wires were held by the Dings magnet and pressed into the belt at the snub pulley. Later a belt wiper was installed ahead of the snub pulley and picking up of wires was almost entirely eliminated. The old belt was spliced and torn in several places and allowed water from the ore stream to get on the Dings pulley. Since the life compared well with the lives of previous belts and since it is our practice to put new belts into service as soon as possible after their manufacture, the belt change was made though the old one would probably have given several months additional service.

Mr. C. E. Taylor----Mill Repairs & Changes----October 1941

October 14, Raised solids in the west zinc #1 Rougher from 56% to 62-64%. Tailings were benefitted and the Allen Cones stopped running over. The results in the west zinc section were so good that on the next day the east zinc section was also run with high solids in the rougher.

October 18, West Mill Repairs: Removed 7100 pounds of 1-1/2" rods from the 6x12 Marcy and put back 30 new 3" rods, 8610 pounds. After removing small rods the charge was measured and found to be 1-3/4" low at the feed end. A number of worn rods were removed and put back after reversing ends, making the charge 1-1/2" high at the feed end.

The Ni-Hard chute lining from the 6x12 drag to the 6x12 Marcy was found to be worn out. It was removed and replaced with a new Ni-Hard lining. All of the bottom sections and part of the side liners were put in. The liners removed have been in service since June 25, 1940. Installed in #1 Marcy Mill a complete set of 1-1/4" x 4" soft steel lifter bars, 20 pieces cut from 2 steel plates 36"x 1-1/4" x 72". Lifter bars should increase the liner life about 6 months. The discharge head of #2 Marcy was protected against wear by wedging steel rods in the space exposed at the outer edge of the head liners.

Installed a 4" overflow pipe from the North Allen Cone in the limestone treatment system in upper part of mill. This pipe was connected to the 6" overflow from the South Cone, and the 6" pipe was changed to discharge into the ditch outside of the mill. The cones only overflow when there is a surge such as when starting up or when the 6" pipe to the fine tailings storage east of the plant is obstructed. In the first case, nothing is to be done as the overflow period is short, but when the 6" pipe needs clearing out and there is a continuous overflow from the tanks shown the necessary steps will be taken to return the system to normal operating conditions. With our former hook-up the Allen Cones could overflow fines into the feed to storage in the Bottom for days without attention. The new system should result in less of the objectionable fine cores at the storage piles.

East Mill Repairs: One of the Ni-Hard liners placed in #4 Marcy Mill on 5/29/40 was found to have a piece broken out of it 2" x 5". Since the shell is still protected by 1/4" rubber backing it was left in place. The liner thickness is now 1-1/4". It would appear from this occurrence that Ni-Hard liners cannot be considered at this time as adequate substitutes for manganese liners. Manganese liners wear down to 1/2" and have an average life of 34 months. It is fair to assume that the Ni-Hard life will not exceed 24 months, and will probably be much less. Worn out manganese liners are used in various places about the mill as wear protectors, while Ni-Hard have only scrap value as it is impossible to fabricate them. The cost of Ni-Hard liners is 4.29¢ per pound, as against 11.2¢ for manganese liners. Nickel for Ni-Hard castings (4%) is now difficult to obtain because of defense demands, and later will not be obtainable for this purpose.

Mr. C. E. Taylor----Mill Repairs & Changes in October 1941

October 20, installed a drive on the sodium silicate mixer in top of the mill. The mixer was formerly driven by the E or W elevator drive and, since removal of elevators, agitation has been by hand and necessarily imperfect. The new drive consists of a 1/4 HP Frigidaire motor, a second-hand washing machine speed reducer and a 3-belt Vee belt drive to the vertical shaft of the mixer by 2 small bevel gears. The driven pulley of the Vee belt drive is a flat faced 12" diameter pulley which works satisfactorily.

October 23, Raising solids in E and W #1 Zn Roughers from 56% to 64% has resulted in marked improvement in zinc flotation. With cold weather approaching, it will become increasingly difficult to maintain clear overflow from the Dorr Thickener Tanks and raising solids in the cells, which is accomplished by slowing the Dorrco pumps, will further aggravate this condition. From this time on, therefore, closer attention was paid to the Dorr Thickener operation.

October 25, East Mill Repairs: 2 zinc pumps, #17 and #11A, were overhauled today and new impellers were put in. The life of #17 impeller (zinc sump pump) was 1 year and the life of 11A impeller (zinc cones) was 2 years 2 months. Both impellers were Ni-Hard; the life of parts made of Ni-Hard is much longer than for those made of any other material tried in this mill.

A bend in the 4" pipe carrying tailings to the bottom located under the tailings drag was covered with Lumnite cement grout about 3" outside of all sides of the pipe. Short pieces of worn Marcy rods were put in as reinforcement. This is a satisfactory method of protection against wear in pipes, especially at bends where the wear is most rapid.

West Mill Repairs: Removed one link from each chain of the 6x12 drag classifier, leaving 273 links with an average pitch of 4.331".

October 27, The east zinc Dorr Tanks were operated in parallel for a few days and were changed back today to series operation because of loss of floated zinc with the overflow from the tanks. Skimmers are required to hold back floated zinc. It would seem that parallel operation should give a clearer overflow in cold weather than series operation. The west zinc Dorr Tanks receive the discharge of the zinc sump pump and this increases the difficulty of maintaining clear tank overflow and the loss of zinc in the overflow; series operation was found better on this side because of this condition. All Dorr Tanks were equipped with levelling belts so that the overflow can be made uniform over the whole overflow edge. This should result in less solids in the final overflow.

October 29, Started the use of lime in the east Pb section, with no other changes. Lime was fed at the former rate of 50 pounds per day.

Mr. C. E. Taylor---Mill Repairs & Changes in October 1941

WEIGHTOMETER TESTS

West		East	
10/4/41	.114% Low	10/4/41	No Check
11	No Check	11	1.03% Low
18	1.10% Low	18	No Check
25	No Check	25	.96% High

Average Screen Analyses, Feed to Flotation:

East Unit: 3.2% on 48-mesh; 11.9% on 65-mesh; 23.9% on 100-mesh; 50.4% on 200-mesh; all cumulative.

West Unit: 2.9% on 48-mesh; 11.5% on 65-mesh; 25.1% on 100-mesh; 49.4% on 200-mesh; all cumulative.

POWER FOR GRINDING---KWH PER TON

	West	East	Total
Dry Tons Crushed	21100.1	20761.1	41861.2
Telsmiths	.225	.200	.212
Gyraspheres	.643	.667	.655
6x12 Marcys	3.256	3.214	3.235
Hardinge Mill	1.013	1.030	1.022
4x10 Marcys	3.419	3.433	3.426
TOTAL	8.556	8.544	8.550

WATER FOR FLOTATION

	Average	Maximum	Minimum
Turbidity	14	25	9
pH	7.6	7.8	7.5
Temperature, F.	71	78	63

Total Rainfall .82" Maximum .40" 10/9/41

Total days operating time 23-2/3 days.

TIME LOST FOR REPAIRS, BASED ON TELSMITH RUNNING TIME

East Unit:

10/2/41	1 Hour 10 Minutes, 6x12 Classifier drive chain broken.
3	25 Minutes, Ditto.
4	Feed off at 12:30 for week end.
6	10 Minutes, Starting up 5 min, chute under Telsmith choked 5 min.
8	30 Minutes, 6x12 classifier drive chain broken 25 min, adjusting Gyrasphere conveyor belt 5 min.
9	3 Hours 10 Minutes, 6x12 classifier head sprockets out of line.
10	Feed off at 7:00 AM for repairs & week end.
13	10 Minutes, Starting up.

Mr. C. E. Taylor---Mill Repairs & Changes in October 1941

COPY

10/15/41 35 Minutes, Part feed, 4x10 Marcys by-passed, long rod broken on Duplex classifier.
16 45 Minutes, Part feed, continuation of repairs started on 15th.
18 Feed off at 12:30 PM for week end.
20 5 Minutes, Starting up.
25 Feed off at 7:00 AM for repairs & week end.
27 5 Minutes, Starting up.

West Unit:

10/2/41 10 Minutes, Chute to #1 Marcy choked.
4 Feed off at 7:00 AM for repairs & week end.
6 5 Minutes, Starting up.
8 20 Minutes, 6x12 by-passed tightening shell liner bolts.
10 10 " Shell liner bolt out of 6x12 Marcy, 6x12 Marcy by-passed 40 min.
11 Feed off at 12:30 PM for week end.
13 10 Minutes, Starting up.
16 20 " 6x12 by-passed tightening shell liner bolts.
17 25 " Ditto
18 Feed off at 7:00 AM for repairs & week end. #2 Marcy (4x10) by-passed 15 min shell liner bolt out.
20 5 Minutes, Starting up.
24 5 " Chute to #1 Marcy choked.
25 Feed off at 12:30 PM for week end. Pipe line to Hardinge feed pump choked 5 min.
27 5 Minutes, Starting up.
31 30 Minutes, 6x12 Marcy by-passed tightening liner bolts.

HARDINGE MILL:

10/6/41 5 Minutes, Starting up.
13 30 " " "
14 Initial feed off 2 hrs 25 min pumping out dam.
20 5 Minutes, Starting up.
27 5 " " "
28 Initial feed off 1 hr 35 min pumping out dam.

(Signed) L. J. Weintz

COPY

Dewis file

December 19, 1941.

Mr. C. E. Taylor, Office.

Mill Repairs & Changes--November 1941

November 1. The west mill was shut down at 7:00 AM and the east at 12:30 PM. The Hardinge Mill was shut down at 12:30 PM; 2 small holes were found and patched. One hole 8" diameter was patched with 2 Ni-Hard blocks and one hole 3" diameter was patched with a pebble, both set in neat Lumnite cement. The lining at the feed end conical section is getting quite thin and may not last much longer.

West mill repairs: Opened the 6x12 Marcy to examine the lining and rod charge. The charge was low at the feed end, so a number of rods were reversed in order to build up the charge to 1" higher at the feed end than at the discharge end. The shell liners are beginning to wear smooth; there are hardly any corrugations or waves left. The set of shell liners removed from the east 6x12 Marcy will be reconditioned for further use in the west mill. Rods are to be welded along the longitudinal edges, and bolt holes will be cut with a wide taper so bolts will not pull through. Installed a new feed dipper on #1 Marcy Mill. Cut a 2-1/2" x 48" slot in the overflow edge of #2 Zn Dorr Tank and installed a sheet iron skimmer submerged 1". Repaired the booster tailings pump in the mill. Installed the spare 4" Wilfley. The 4" Wilfley frame removed was badly worn as all pumps in service must be and will be overhauled so all the others can be rehabilitated. Lined the suction box above the zinc concentrates pumps, west side, with 2-1/2" Lumnite cement (neat) and steel grinding balls. The bottom was about worn out and had started leaking. Installed a new bottom half of the Gyrasphere crusher oil tank; the bottom was rusted through and leaking. Changed oil in the Gyrasphere crusher. Inspected the spiegel bottom wearing plates in the 6x12 drag classifier and found 5 with holes worn in them; they will be replaced when the present chain is removed.

Installed a rubber belt wiper ahead of the snub pulley on the 36" conveyor belt in the Rock House to clean off wires that stick to the belt and are driven into the rubber by the snub pulley. Changed one troughing idler (2nd from tail end) on the same belt.

East Mill Repairs: Rod additions and usual adjustments and inspections.

November 5. The west zinc midds were changed from the head of #2 Zn Rougher to the head of #1 Zn Rougher as an experiment while running with high solids (65%) in the #1 Rougher. Tailings were markedly higher after this change, so midds were changed back. It appears that the conditioning effect in the first rougher with a thick pulp is highly advantageous in the preparation of pulp for flotation. When midds were moved to the head of #3 Zn Rougher, #1 and #2 became conditioners (no froth is formed when the pulp is as

thick as 65%-66% solids) and all of the floating was done on #3 Zn Rougher. Tailings were good, but the practice was abandoned as unsafe; tailings might pass out the end of the single cell unnoticed. It is better to have a second cell to catch zinc passed by the first one, either by some upset of the system or by sudden enrichment of the feed.

November 7. Raised the outer rings of East #1 and #2 Zn Dorr Tanks to hold floated zinc in the center of the tank and thus avoid loss in the tank overflow.

Tried the effect of pumping feed to the East #1 Zn Rougher and pumping tails of #1 Zn Rougher to the head of #2 Zn Rougher. Tailings were higher due to lower pulp density (53%) caused by addition of pump gland water to the pulp.

The West #2 Zn Dorr Tank started overflowing muddy water because of slow pumping to maintain 67% solids in the Zn Rougher. A search was made for water being wasted and returned to the west side by the sump pump. All pump gland water was cut to 1/2-turn of the valve and all hoses were cut off. The tanks were in series operation. When water becomes colder and it becomes more difficult to maintain clear overflow from the tanks parallel operation will be resorted to.

November 8. The east mill was shut down at 7:00 AM and the west at 12:30 PM. The Hardinge mill was shut down at 12:30 PM to inspect the lining. Three holes were found, one 8" diameter and one 4" diameter in the conical feed section, and one 4" diameter in the cylindrical portion. One Ni-Hard block was used for the big hole and the other two were patched with pebbles.

East Mill Repairs: Removed 440 pounds of small rods from the 6x12 Marcy and put in 6 new rods, 1746 pounds. Measured the charge and found it to be 3" low at the feed end. Reversed a number of rods to make the charge 3/4" high at the feed end. Installed new Ni-Hard liner plates at the top of the chute from 6x12 drag to the Marcy mills; plates GB-368 and -369. Ni-Hard side liner plates were also installed and the top of the chute to the 6x12 Marcy was lined for a length of about 9" with steel balls set in Lumnite cement.

Installed a 12" extension to the inner feed well ring in #2 East Pb Dorr Tank, making it 30" deep instead of 18". Raised the outer ring above the water level.

West Mill Repairs: Removed one link from each chain of the 6x12 drag, leaving 272 links.

November 10. Started using exhaust steam from skip hoisting engine in the E and W Pb Rougher Cells. There is a 2-1/2" pipe for this purpose to the head of each cell. Steam will be used every day instead of being wasted through the power plant exhaust pipe to the atmosphere.

Mr. C. E. Taylor---Mill Repairs & Changes---November 1941

Changed the zinc sump pump to discharge into the head end of #3 West Zinc Rougher to help clear up the overflow of the west Zn Dorr Tanks.

Changed the Pb sump pump to discharge into the east #1 Pb Dorr Tank to save lead in rejects of the E and W feed samplers which formerly by-passed the lead cells entirely. The amount of solids from the E and W feed sampler rejects was measured at 12 tons per 24 hours.

November 11. A carload of 1-1/2" steel balls was received. Weight of one ball 230 grams. Weight of old 1-5/8" balls 304 grams each. Started using the 1-1/2" balls and will continue to do so for the next 3 months to determine the difference in grinding capacity and wear resistance if any.

Cold weather has started to affect flotation. All efforts are being made to preserve clear tank overflows while maintaining high pulp density in the zinc roughers (66%).

November 12. Turned rejects of tailings samplers which have been discharging into #3 Zn Rougher west side back into the tailings sampler in such manner that they were not sampled again. The zinc sump pump is now used only to handle these rejects, and this is a source of apprehension since zinc may find its way to the sump at any time, though care is being taken to prevent this happening; nothing but tailings rejects is supposed to go to the zinc sump pump, everything else is held back on the floor to be washed to the cell at the proper time. The west tailings have been higher than the east, possibly because of the sump pump discharging into the west zinc roughers and reducing the percent. solids of the pulp; this condition is no longer present.

November 13. Feed screw shaft on #2 Marcy broke; it was a 3-7/16" C. R. Shaft installed 8/7/40. It was replaced by a new 3-1/4" hot rolled steel shaft fitted with Ni-Hard flights.

Turned the rejects of the tailings samplers to the Stamping Ground and set free the sump pump to handle material again for which it was designed. The sump material is now pumped to the head of #2 West Zn Rougher if it is lean, and to the froth launder of this rougher if it is rich; it is not allowed to accumulate on the floors.

High pressure steam was used in the E and W Pb Roughers from 3:00 PM till 7:00 AM the next morning. This was done to determine the effect and the approximate cost. The cost was 5 tons of coal, or $11.00 to $12.00 per day. Tank overflows in the zinc section were muddy when the steam was started at 7:00 AM (exhaust steam used from 7:00 AM to 3:00 PM) and cleared up by 11:00 PM and remained clear for the balance of the 24-hour period. Tank temperatures rose from 60° F to 67° F. Laboratory reports were better on the day steam was used than on the following day. Longer tests will be required to determine if there is sufficient improvement

to warrant the use of high pressure steam for heating the flotation pulps.

November 15. Cut feed off the west mill at 7:00 AM and off the east mill at 11:30 AM to give electricians opportunity to hunt for a ground in the mill electrical circuit. The Hardinge mill was shut down at 11:30 AM to inspect the lining and one large hole was found at the feed end 30" long and 12" wide. It was patched by covering it with a 1/4" plate 35" x 18" held to the shell by 2-3/4" bolts welded to the plate. The space in back of the plate was filled with neat Lumnite cement grout. This is the first time this method of patching the lining has been used. The lining on the cylindrical portion and the discharge conical section is much thicker than at the conical feed end section where it is so thin that it is no longer possible to patch in the usual manner with pebbles or Ni-Hard blocks set in Lumnite cement.

Set up the Telsmith Crusher 1/4". Shims before setting up were 1/2" in thickness and are now 3/4".

The Gyrasphere crusher was dismantled as it had reached the end of the set up adjustment. Installed a new concave and a used mantle which was raised 1/4" above the sphere head by 1/4" shims. A piece of 1/4" x 1-1/4" flat iron was welded to the sphere head at the lower edge of the mantle to keep zinc backing from squeezing out. Installed a new eccentric assembly consisting of eccentric, gear, bronze bushing and oil ring received this year at a cost exceeding $800.00. The bronze bushing in the eccentric removed was broken in several places and was scoring the shaft. Installed new seal leathers. Did not change oil in the crusher. Inspected all wear protectors and replaced rubber on the lower frame. Set the crusher at 5/16" opening with 5 set up lines showing, and 1-3/4" projection. Mr. Barnard gives the life and cost data of the crusher parts.

"Lower Mantle: The mantle #17 removed had been installed in the crusher 10/29/40. It was purchased from the Kensington Steel Company on order ACB-3165, dated 8/4/39, and cost $106.53. It was first installed in the west crusher 12/14/39 and was removed 1/23/40, or one month and 9 days later. During this time it had crushed 33,629 tons. From 10/29/40 to its final removal 11/15/41---10 months 12 days working time---it crushed 277,428 tons, or a total life of 11 months 21 days. The total tonnage crushed was 311,057 tons, at a cost per ton of $.00034248. When removed it weighed 252 pounds, or it had lost 297 of its original 549 pounds, or 54.1%, at the rate of .0009548 pounds per ton crushed. It was approximately 1/2" thick when removed.

"The lower mantle installed, #9, was purchased on order GB-1196, 3/23/37, at a cost of $145.50. It has been in service in the 1-E crusher on 2 other occasions---9/17/37 to 4/14/38, 6 months 27 days, 170,422 tons crushed; and 6/25/41 to 8/23/41, 1 month 13 days, 38,495 tons crushed.

"Concave Ring: The concave removed, #18, had been installed 10/29/40. It was purchased on order AGB-4017, 1/2/40, at a cost of $119.46. During its life of 10 months 12 days working time, it had crushed 277,428 tons, at a cost of $.0004306 per ton. When removed it weighed 370 pounds, or had lost 297 pounds, or 44.5% of its original 567 pounds, at the rate of .001071 pounds per ton crushed.

"The concave installed, #20, was purchased on order AGB-5866, 11/26/40, and cost $106.21. It weighed 593 pounds, and has seen no previous service.

"Inner Bronze Bearing: The bearing removed was the original bearing furnished with the crusher. Its cost is estimated at $118.00. The following is the record of its service:

Installed		Removed	Life			Tons
1-W	1/31/36	9/29/36	7 Months	28	Days	159,670
1-E	12/12/36	2/9/37	1 "	27	"	44,984
1-W	8/20/37	5/28/38	9 "	8	"	227,893
1-W	1/23/40	11/15/41	19 "	18	"	506,675

This makes a total life for this bearing of 3 years 2 months 21 days, and a total tons crushed of 939,222, at a cost per ton of $.0001256.

"The sleeve installed was purchased as part of the eccentric and gear assembly on order AGB-7012, 6/18/41, at an estimated cost of $144.74. The entire assembly was installed at this time."

Pumped down the #2 Zn Dorr Tank to inspect the feed well and 10' ring and found a cone welded to the inner ring. Removed the cone, leaving the feed well 31" deep, 48" diameter. Installed in the top of the feed well a 42" diameter baffle, the same as in #2 East Zn Dorr Tank. Arranged the tank and pump for circulation of the contents of the tank during shut down periods.

East Mill Repairs: While attempting to clean out the circular launder previously built onto the 10' ring in #1 Pb Dorr Tank the ring collapsed and fell into the tank. The tank was pumped empty and the remains of the ring and launder were removed. A new outer baffle ring 10' diameter by 12" deep was installed in the tank. A new 3" plug cock was placed in the tank drain pipe. Arranged the #2 Zn Dorr Tank and pump for circulation of the contents of the tank during shut down periods.

November 17. Turned the rejects of the tailings sampler into an idle pump in the Nash Air Compressor Room which discharges into the 18" tailings pipe to the Austin Meadow.

Mr. C. E. Taylor---Mill Repairs & Changes---November 1941

November 19. Installed spouts and pipes for circulating the contents of the E and W #2 Pb Dorr Tanks at shut down periods. All tanks are now so equipped, and all are circulated at every shut down. The ore in circuit is ready to float now when the mill is started, and there are no losses of lead and zinc or delays as there were in the past. Circulation of the tank contents has been the most important change for successful intermittent operation (5-day week) of the flotation operation.

November 20. Thanksgiving Holiday was observed. The whole plant was idle for 24 hours starting at 11:00 PM, November 19, and ending at 11:00 PM, November 20.

Mr. B. D. Crawford and Mr. R. H. Lowe, of the American Cyanamid Company, called here yesterday and recommended the use of Sodium Aerofloat "B" in the zinc section to help float zinc from the slimes in the feed. The cost is the same as A-25, and smaller quantities are recommended, .02 pounds per ton of feed.

November 21. Started feeding 30 cc of 10% sodium aerofloat to the head of #1 E Zn Rougher. We had 66 pounds of sodium aerofloat left from the old stock purchased 7 or 8 years ago. 60 cc were first put in the cell, as this equalled .02 pounds per ton as recommended, but the grade of concentrates was lowered by the flotation of iron. and the quantity was reduced to 30cc.

November 22. Cut feed off the east mill at 7:00 AM and the west at noon. Cut feed off the Hardinge Mill at noon, lining OK.

East Mill Repairs: Removed the launder from the outer ring in #2 Zn Dorr Tank. The feed well is 48" diameter, 48" deep and the outer ring is 10' diameter by 36" deep. The circulating pipe from the Dorrco pump was extended to discharge inside of the 10' ring.

West Mill Repairs: Changed oil in the Telsmith crusher (1000 hours). A new charge of filtered oil was put in the crusher. The pipes and tank were cleaned out. Reversed the direction of the Gyrasphere crusher motor and crusher pump so the new bevel driven gear which was put on last week will engage new pinion teeth surfaces. The Vee belt drive now has tight sides of belts on bottom instead of on top as they were. Removed one link from each chain of the 6x12 drag classifier, leaving 271 links with average pitch of 4.362". Prepared for rebuilding the west zinc cleaner cell; installed a pipe to carry the west zinc rougher froth to the head of the east #1 Zn Cleaner Cell. Starting next Tuesday at 3:00 PM all east and west zinc rougher froth will be handled in the east zinc cleaner cells, and this will be continued till the west cleaner is again ready for service. Carpenters will work two shifts every day till the work is completed. The east #7 Cleaner was equipped with bottom and top baffles between each set of cell bottoms, and froth was discharged over the side instead of over the end; this necessitated the use of the emergency pump to pump the #1 Cleaner

froth to the head of #2 Cleaner.

November 24. Changed the west A-25 to Pb section from 8 cc to 5 cc and arranged for it to go through a pump with the feed instead of direct to the head of the rougher. The lead grade and recovery was better with less A-25 when mixed in a pump than when a greater quantity was used without previous mixing.

Turned the spigot of #2 East Zn Dorr Tank into the launder of #1 Zn Rougher to the head of #1 Zn Cleaner. This product contains a large amount of the finest zinc in the ore which seems to be ready to float but which apparently gets away when passed through the roughers.

November 25. Changed the A-25 to the East Pb section to the same quantity and same place as in the West Pb section.

The evening shop shift started dismantling the west Zn Cleaner Cell which is to be rebuilt.

November 26. The carpenters started rebuilding the west Zn Cleaner Cell of local white pine. The construction is to be the same as that of the old cell. Flotation results were very good in east and west zinc flotation while operating with only one cleaner cell. All of the midds were handled in the east zinc roughers and the west roughers were made to operate by reducing the pulp density to 44%-46% at the tailings discharge end; this was accomplished by pumping more water out of the west Zn Dorr Tanks. The east pulp density at the tailings discharge averaged about 38%. The new cell was put in operation December 1.

November 29. Cut feed off the west mill at 6:15 AM and off the west at noon. Feed was cut off the Hardinge at 7:00 AM and 2 small holes were found and patched by drilling a hole for a 3/4" bolt and by the use of an 8" disc of 1/4" manganese steel.

West Mill Repairs: The 6x12 drag chain was worn out and would probably have broken in the next week, so it was removed and the drag was rebuilt. Installed 6 new spiegel bottom wearing plates, 1 new Ni-Hard bottom wearing plate (5th from the tail end) and 3 used spiegel plates. Installed new 1/2" rubber belt on wood strips at both sides of the drag. Installed 2 matched #124 used manganese steel chains recovered from the scrap pile and 286 new flights 3/8" x 4" x 36" made of #1045 steel, flame hardened. There were 286 links in each chain with an average pitch of 4.134" (pitch when new 4.06"). Installed 2 used steel plate head sprockets with a pitch of 4-3/16". These sprockets were made here and installed in the west drag on 10/8/40. They were made of 1-1/4" soft steel plate and with teeth cut by the oxy-acetylene torch. They were in service in the west drag till 5/3/41, when they were removed because the #4124 worn chain (chain put on 2/14/41) had started to climb the sprocket teeth, indicating the need of longer pitched sprocket teeth. Cast iron sprockets with 4-5/16" pitch were then put on and were removed today, worn out. The plate sprockets put

on today were first trimmed with a torch to restore them to the approximate shape of the original teeth and were then flame hardened by heating to a red heat with the oxy-acetylene torch and quenching while still red. The hardness was thus increased from 30 to 65 on the sclerescope scale. Installed a pair of 24" diameter pulley idlers to support the top chain near the head sprockets; they also act as holding down idlers for the bottom chain to keep it from rubbing on the steel cross beam at that place. Installed a pair of 25-1/2" diameter pulley idlers near the classifier launder to hold down the bottom chain. The tail traction wheels were tight on the tail shaft and good for further service, so were not removed. The reconditioned chain and new flights had been previously assembled in 10' lengths and were installed in this manner with some saving of time. All work on the drag was completed in 8 hours, which was faster time than ever made before when a drag was completely rebuilt.

The #4124 chain removed today had a life of 13.3 months running time (elapsed time was about 15-1/2 months) which was better than the life of the only previous chain of this type (12 months elapsed and running time). The #4124 Promal Link Belt chain does not wear as well as the #124 manganese steel chain, as is indicated by the link removals to take up wear. Links are removed every 2 weeks in the case of #4124 chain and every 3-1/2 months in the case of manganese #124 chain. The #4124 chain has more points to wear than the #124 chain, and the open link #124 chain has ample strength for our present conditions. The 62-teeth tail sprockets formerly used broke the chains long before they were worn out because of the elongated worn chain pitch not fitting the fixed sprocket tooth pitch; traction wheels with no sprocket teeth cured this trouble and the use of head sprockets with longer pitch between teeth to match the elongated pitch of worn chain makes it possible to wear the chain out completely. We have one new #4124 chain and one new #124 chain in the supply house (2 strands each), but will not use them till all of the used #124 manganese steel chain formerly scrapped has been put in service again. We have several years (5 or 6) supply of this chain on hand. The attached prints 8-GB-2051, -2053-A, -2055 and -2057 show the life and cost data of sprockets, flights and chain.

Removed 3165 pounds of minus 1-1/2" rods from the west 6x12 Marcy and put in 15 new rods, 4370 pounds. The shell lining is badly worn and beginning to give some trouble by bolts pulling through.

Removed the launder from the outer ring of #1 Zn Dorr Tank, leaving a 10' diameter ring 36" deep. The inner feed well is 48" diameter by 48" deep.

East Mill Repairs: Removed one link from each chain of the 6x12 drag, leaving 280 links with an average pitch of 4.251". The last time links were removed from this chain was August 9, 1941 (3-1/2 months).

Mr. C. E. Taylor---Mill Repairs & Changes---November 1941

WEIGHTOMETER TESTS

West		East	
11/1/41	OK	11/1/41	No Check
8	No Check	8	.48% Low
15	No Check	15	1.07% High
22	.143% High	22	No Check
29	No Check	29	1.62% Low

Average screen analyses, feed to flotation:

East Unit: 3.5% on 48-mesh; 11.9% on 65-mesh; 25.1% on 100-mesh; 51.5% on 200-mesh; all cumulative.

West Unit: 3.1% on 48-mesh; 11.2% on 65-mesh; 23.9% on 100-mesh; 50.4% on 200-mesh; all cumulative.

POWER FOR GRINDING---KWH PER TON

	West	East	Total
Dry Tons Ore Crushed	17525.9	17810.4	35336.3
Telsmiths	.244	.208	.226
Gyraspheres	.681	.697	.689
6x12 Marcys	3.395	3.290	3.342
Hardinge Mill	1.062	1.045	1.054
4x10 Marcys	3.591	3.503	3.547
TOTAL	8.973	8.743	8.858

WATER FOR FLOTATION

	Average	Maximum	Minimum
Turbidity	19	50	9
pH	7.5	7.8	7.2
Temperature, F.	62	66	58

Total Rainfall 1.46", Maximum .71" 11/5/41.

Total days operating time 20-1/6.

TIME LOST FOR REPAIRS BASED ON TELSMITH RUNNING TIME

East Unit

11/1/41	Feed off at 12:30 PM for week end.
3	5 Minutes, Starting up.
8	Feed off at 7:00 AM for repairs & week end.
10	20 Minutes, Starting up 10 min, 4x10 Marcy overloaded 10 min.
15	Feed off at 10:45 AM, ground in electric wiring, repairs & week end.
17	5 Minutes, Starting up.
19	2 Hours 30 Minutes, Shutting down for Thanksgiving Holiday.
20	24 Hours, Thanksgiving Holiday.
21	5 Minutes, Starting up.

Mr. C. E. Taylor---Mill Repairs & Changes---November 1941

11/22/41 Feed off at 7:00 AM for repairs & week end.
24 10 Minutes, Starting up.
26 5 Minutes, Feed box to Hardinge Mill choked.
28 5 Minutes, Tightening sprockets on speed reducer to conveyor.
29 Feed off at noon for week end.

West Unit

11/1/41 Feed off at 7:00 AM for repairs & week end.
3 5 Minutes, Starting up.
8 Feed off at 12:30 PM for week end.
10 10 Minutes, Starting up.
12 6x12 Marcy down 15 min tightening shell liner bolts, #2 4x10 Marcy down 4 hrs 35 min feed screw broken.
15 Feed off at 7:00 AM for repairs & week end.
17 15 Minutes, Starting up 5 min; tightening clutch on Telsmith feeder drive 10 min; 6x12 Marcy down 30 min putting in a new shell liner bolt.
19 2 Hours 30 Minutes, Shutting down for Thanksgiving Holiday.
20 24 Hours, Thanksgiving Holiday.
21 1 Hour 5 Minutes, Starting up 5 min; repairs to Speed Reducer 1 hr. The 6x12 Marcy was down 1 hr 25 min tightening shell liner bolts.
22 Feed off at noon for week end.
24 10 Minutes, Starting up.
27 25 Minutes, 6" pipe to Hardinge feed pump choked 5 min; 4x10 Marcys overloaded 5 min. Setting up Gyrasphere 15 min.
28 10 Minutes, 4x10 Marcys overloaded.
29 Feed off at 6:45 AM for repairs & week end.

HARDINGE MILL

11/1/41 Feed off at 12:30 PM for week end.
3 1 Hour 20 Minutes, Starting up & stopping leak at door.
8 Feed off at 12:30 PM for week end.
10 10 Minutes, Starting Up.
15 Feed off at 10:45 AM patching holes in lining & week end.
17 5 Minutes, Starting up.
19 2 Hours 30 Minutes, Shutting down for holiday.
20 24 Hours, Thanksgiving Holiday.
21 5 Minutes, Starting up.
22 Feed off at noon for week end.
24 10 Minutes, Starting up.
29 Feed off at 7:00 AM for repairs & week end.

(Signed) L. J. Weintz

LJWeintz/ESS

Dorr Fil

COPY

January 20, 1942.

Mr. C. E. Taylor, Office.

Mill Repairs & Changes--December 1941

December 1. The west zinc cleaner cell was rebuilt and placed in operation. There were no changes from the former construction. Froth is discharged over the end of all 3 cleaner cells. There are no bottom baffles dividing #1 Cleaner into 5 compartments as there are in the east #1 Cleaner.

Started flowing the spigot of the west #2 Zinc Dorr Tank to the #1 Zinc Cleaner, as is done in the east mill in the endeavor to lower tailings by catching some of the fine zinc from slimes that now goes out in the tailings.

December 2. In the E and W Pb Roughers changed the froth overflow side boards from the last 3 bottoms so as to turn froth from these bottoms to the Pb Cleaners instead of to the heads of the roughers with the feed as has been the practice for the past few months. This restores 11 bottoms in each rougher to rougher service, where there was formerly only 8. Lead grades have been better than required and recoveries have suffered, hence this change to better the recovery.

December 5. Overflow of the west #2 Zinc Dorr Tank was muddy (series operation), so a change to parallel operation was made. When the conventional parallel operation is used, that is, half of the overflow of the Dorr Bowl to each tank, the effect of running slimes to the #1 Cleaner is lost in part, but the overflow is clearer.

December 6. Cut feed off the east mill at 7:00 AM for repairs and off the west at noon. The Hardinge mill was shut down at 7:00 AM to examine the lining and 2 small holes were found in the feed end conical section. The large patch plate put on a few weeks ago was found to be loose. A new 1/2" plate was put in its place and an extra 3/4" bolt was installed to hold it more securely. The two small holes were patched in the same manner with 1/4" manganese steel patch plates held by a through bolt. Neat Lumnite cement was placed in back of all plates.

East Mill Repairs: Installed a new feed dipper on the 6x12 Marcy mill. The worn out dipper was installed 11/19/40. Also installed a new feed end right hand trunnion liner cemented in place with neat Lumnite cement; the one removed was installed 9/9/39. Changed oil in the 6x12 drag speed reducer (3 months).

West Mill Repairs: Changed oil in the 6x12 drag speed reducer (3 months). Removed one link from each chain of the 6x12 drag, leaving 285 links with an average pitch of 4.148".

December 13. Cut feed off the west mill at 7:00 AM, and off the east at noon. The Hardinge lining had no holes in it.

Mr. C. E. Taylor----Mill Repairs & Changes---December 1941

West Mill Repairs: Opened the 6x12 Marcy to inspect the shell liners which are now worn smooth, with no waves remaining, and beginning to gouge out at intersection points, thus exposing the shell. Installed 2 reconditioned shell liners with rods welded along their edges to fill the space and protect the shell. The liners installed were removed from the east 6x12 Marcy early this year. The #1 Pb Dorr Tank was pumped down to paint floor beams over the tank. It was then seen that 1/6th of the outer steel ring in the tank had been removed at some time. The ring was completed by bolting on it a piece of thin sheet iron. It is now 10' diameter by 3' deep. The inner feed well is 48" diameter by 48" deep.

East Mill Repairs: Installed a dry lime feeder over the head end of the 6x12 drag classifier driven by a 42" pulley from the 6x12 drag head shaft at a speed of 60 RPM.

December 14. Installed a new manganese steel grizzly bar over the mine crusher and respaced the others to stop coarse lumps from getting by the crusher.

December 15. Removed the upper baffles from #1 East Zinc Cleaner, and left the lower baffles, one between each set of bottoms, resting on the bottoms. Discontinued the side froth discharge from this cell and started discharging over the end of the cell. This discontinues the use of one pump which for the past few weeks had been pumping #1 Zinc Cleaner froth to the head of #2 Zinc Cleaner.

December 17. Changed the E and W Zinc Dorr Tanks to parallel operation. The whole overflow of the Zinc Dorr Bowl was piped to the #1 Dorr Tank, and the 4" valve between #1 and #2 Tanks was operated to maintain a clear overflow from both tanks. The overflow of #2 Tank is through a 4" pipe which passes through the overflow launder of the tank to waste. The overflow edge of the 4" pipe is protected by a skimmer against loss of zinc by floating froth. The 4" connecting pipe is about 5' below the top of the tank. By this parallel method the tank overflow is kept clear and fines from #2 tank are continued to the zinc cleaner cell.

December 18. Received a carload of 3" diameter by 12' rods from Republic Steel Company (2 orders):

AGB-No.	Date	Heat No.	Carbon	Man.	Phos.	Sulfur	Sil.	Weight	No. Rods	Weight Per Rod
6475	3/24/41	87488	1.06	.27	.024	.034	.18	16410	56	293.04
7631	11/3/41	85573	.67	.79	.072	.052	.28	100910	340	296.79
Old Analyses, Satisfactory			1.04	.49	.022	.024	.20			

The order AGB-6475 rods were marked by welding a lump on each end at the center with the arc welder.

The order AGB-7631 rods were marked by cutting a hole

1/4" diameter by 1/4" deep at each end in center of rod by acetylene torch. Later tests will determine which of the 3 analyses give the best service.

December 19. Changed the 2-1/2" steam pipes to E & W Pb Roughers to 4" pipes in order to get more exhaust steam when the skip hoist engine is working on the day shift. Steam heating of flotation pulp is a definite help; the small cost of additional coal burned for 24-hour heating of pulp in cold weather would be returned many times in additional lead and zinc concentrates produced.

December 20. Cut feed off the east mill at 7:00 AM and off the west at noon. The Hardinge mill had 4 holes in the feed end conical section which were patched with 10" diameter plates held in place with 3/4" bolts and backed with neat Lumnite cement. Measured wear in the Hardinge feed end and discharge end liners (yearly) and found them OK. The Hardinge dipper was patched and should be good for 6 months more service.

East Mill Repairs: The dry lime feeder was removed from the east side and installed in the same position (over head of 6x12 drag classifier feeding into 6x12 Marcy) on the west side. The use of lime helps clear the Dorr Tank overflow and zinc tailings seem to be better. The change is made to determine if these results follow the lime.

West Mill Repairs: Installed 4 reconditioned shell liners in the 6x12 Marcy. These liners have 3/4" to 1" diameter rods welded to their edges to fill the spaces left because of bad fitting castings.

December 22. Reduced sodium silicate from 1000 cc to 700 cc in E and W Pb Sections, which resulted in lower zinc tailings on both sides.

December 24. Changed lead flotation flow sheet so E and W Pb Rougher froth is all handled in the west Pb Cleaners, leaving the east Pb Cleaners idle. A new pump was installed in the west Pb section driven by a 7-1/2 HP 1160 RPM motor at a speed of 870 RPM. The pump delivers tails of the W #1 Pb Cleaner to a new mechanical distributor located over the west Pb Rougher which splits the midds into two equal portions, one to the head of the West Pb Rougher and one to the head of the east Pb Rougher. The east rougher froth is pumped to the head of the west Pb Cleaner by #3 east pump.

Feed was cut off the E and W mills at 8:30 PM and at 11:00 PM all machinery except tanks and circulating pumps was shut down for the Christmas Holiday.

December 25. Christmas Holiday was observed from 11:00 PM 12/24 to 11:00 PM 12/25. The mill did not operate for this 24-hour period.

Mr. C. E. Taylor-----Mill Repairs & Changes----December 1941

December 26. A 1-1/4" float valve was installed in a branch from the 3" cold water line to the circulated water tank in the top of mill on the east side. Also a 2-1/2" valve for hand operation was installed for make up water if the float valve does not provide enough. This was done to maintain a constant level in the tank without wasting heat by the addition of surplus cold water as is the case when this job is done manually.

December 27. A patch bolt came out of the conical section of the Hardinge Mill shell and a large quantity of muck was thrown on the Hardinge gears, necessitating the shutting down of this mill at about 4 AM. A small piece of grinding steel also came out with the muck and was imbedded in one of the teeth of the large gears, injuring all of the teeth on one side of the pinion. It was decided to reline the mill without further delay. From this unfortunate experience it becomes plain that the time spent in the last month patching the lining did not pay. The risk of injuring the expensive herringbone gears is too great to pay for the little additional liner life. The gears were dressed up and probably have suffered no permanent damage. The ball charge was removed and the lining was cut out with the highway hammer, leaving a section at the feed and discharge ends, as usual, where pebbles do not wear but glaze over. The bolt holes in the conical section of the shell were welded up with the arc welder. The door frame was repaired by welding on 1/2" manganese steel grizzly bars. The first half of new lining was put in on December 28, using part new and part old pebbles, since there were not enough new pebbles on hand for the job.

A ring of Ni-Hard blocks was installed near the man hole door. The second half of the lining was installed on December 29. The mill was charged with the same ball charge on December 30 and it was started at 3:00 PM on that day. The gears made more noise than before this repair, and power was 95 HP. The driven 46" pulley was found to be cracked and worn thin, so it was considered unsafe. A 48" x 16" face steel split pulley in good condition was installed in place of the bad pulley. This lowers the mill speed from 22.2 RPM to 21.2 RPM. Mr. Barnard gives the life and cost data on the Hardinge mill lining:

"Labor:

Discharging Mill	$ 23.81	
Cutting out lining	9.01	
Relining (2 shifts)	51.17	
Recharging and clean-up	8.48	$ 92.47

"Material:

25 Bags Lumnite Cement	@ $2.72	$ 68.00	
3565 Lbs. Danish Pebbles		53.48	
Balance 2nd Hand Pebbles (No Charge)		---	
15 Full Ni-Hard Blocks (1st Patt.)	@ $1.335	20.03	
10 " " " " (2nd ")	@ 1.70	17.00	
21 Half " " " " "	@ .80	16.80	
8 Wedge" " "	@ .31	2.48	177.79

TOTAL COST - - - - - - - - - - - - - - - - - $270.26

Mr. C. E. Taylor-----Mill Repairs & Changes---December 1941

"Comparative Costs:	Sept. 1939		Sept. 1940
Sorting Pebbles	$ 8.40		$ 4.60
Unloading Mill	4.77		3.26
Cutting Out Lining	12.19		9.78
Lining Mill	50.02		45.08
Sprinkling	4.24		Mill Men
Lumnite Cement, 34 Bags @ $2.44	82.96	29 Bags	70.76
Pebbles, 6250 Lbs. @ $1.60/C	100.00	7135 Lbs.	107.85
		Wedges	4.12
TOTALS - - - - - - - -	$262.58		$245.45

"The higher cost in December 1941 is due largely to the fact that the shell on the mill developed a hole which through out muck on the gear, requiring an immediate shut down. This permitted the charge to cement in the mill, requiring a larger labor cost to clean it out and discharge it.

"The cost of the Ni-Hard blocks used in the lining is probably higher than that of a corresponding quantity of pebbles. Part of this charge includes that required for making the patterns. In the future the cost for these blocks should be decreased considerably."

The west mill was shut down at 7:00 AM and the east at noon.

West Mill Repairs: Opened the west 6x12 Marcy mill and installed 8 sections of reconditioned shell liners. There are now 14 pieces of these reconditioned liners in place; 28 pieces make a full set. Mr. Barnard gives the life and cost data of 6x12 shell liners:

"In December the shell liners in the W 6x12 Marcy mill were replaced. The work was spread out over 4 week ends. The week end of the 27th was taken as the change date in figuring the cost data as on this date 10 liners were replaced, leaving 14 for the next week.

"The shell liners removed were the original liners installed in 1936. They were 40-wave liners, weighed approximately 24,188 lbs., and cost $2726.06, estimated. They were put in service 10/30/36, and removed 12/27/41, giving a life of 4 years, 11 months, 14 days. When removed they weighed 8554 lbs., or had lost 15,634 lbs., or 64.64% of their original weight. During the life of the liners they crushed 36.4% of the west side tonnage, or 555,859 tons. They have worn at the rate of .028125 lbs. per ton, and have cost $.004904 per ton. They were purchased as part of order GB-12058, dated 7/8/36.

"The liners installed in December 1941 in the west mill

were the original liners that came with the east mill, which had been removed 3/25/41 and reconditioned. The original weight, cost and order number are the same as the west side liners enumerated above. They have already lost 10,568 lbs., or 43.69% of their weight, at the rate of .0215334 lbs. per ton, having crushed 490,772 tons."

Changed oil in the Gyrasphere crusher. Removed one link from each chain of the 6x12 drag, leaving 284 links, with an average pitch of 4.163".

East Mill Repairs: Changed oil in the Telsmith crusher. Cleaned out the 6x12 Marcy water pipes and strainer.

December 28. The east Gyrasphere crusher was dismantled (it had been making a queer noise) and the mantle was found to be cracked and loose on the head. It was removed and the spare #4 used mantle was put in its place. This mantle is raised 1/4" above the sphere head and has a 1-1/4" x 1/4" flat steel band around the bottom of the sphere head to keep zinc backing in place. The old concave was in good condition, so was not changed. It was installed new on April 2, 1941, and was not changed on August 23 when the mantle was changed. The crusher was set at 5/16" opening; there were 3 set up lines showing, and 1-1/8" projection. Mr. Barnard gives the life and cost data of the mantle removed:

"Following is the record and cost data on #12 Mantle removed from E Gyrasphere 12/28/41. It was purchased on order GB-3204, cost $158.61 and weighed 540 lbs.

Installed	Removed	Life	Tons Crushed	Cost Per Ton	Discarded Weight
W-9/7/38	2/10/39	5 mo 3 da	140620	$.0011279	409
E-4/2/41	6/25/41	2 " 23 "	53034	.000819	--
E-8/23/41	12/28/41	2 " 29 "	79685	.000580	270--50% weight lost.
	TOTAL - -	10 mo 25 da	273339		

When removed it was approximately 5/8" thick and contained a crack 8" long.

"When this mantle was last installed (8/23/41) a band, in several pieces, had been welded around the base of the mantle to prevent the 1/4" zinc backing from coming out. When removed a piece of this strap had broken loose at the weld and torn off the rubber wear protection. The zinc, at the place the strap was broken, was broken up and loose. In the future the steel strap is to be welded on in one piece which should not loosen so easily.

"No. 4 Mantle, installed in E Gyrasphere 12/28/41, was

purchased 3/8/36, order GB-8374-A, at an estimated cost of $122.46. It weighed new 554 lbs. It has seen previous service in E Gyrasphere from 6/11/36 to 11/10/36, or 4 months 29 days. During this time it had crushed 105,543 tons, and lost 166 lbs., or 30% of its original weight."

While the crusher was dismantled it was found that one tooth was broken out of the driven bevel gear. The pinion, to all appearances, was not injured at all and was left in place (this later proved to be an error---on January 16 a piece of wood was caught in this Gyrasphere and several teeth came out of the pinion, doing severe damage.. Even though the pinion shows no damage as in this case, we will hereafter discard it after it has gone through any wreck in which teeth of the pinion or the driven bevel gear have been knocked out). The spare eccentric and bevel gear assembly was installed; the gear was brand new, never used before this time. The outer bronze sleeve which is babbitted into the crusher frame was cracked, but good for further service. Two new seal leathers were put in and a new rubber wear protector was put on the deflector plate. Changed oil in the east Telsmith crusher; put in a charge of new Nabob oil and tightened the oil sleeve screws to stop leak at the oil sleeve joint. Two more sections of reconditioned shell liner plates were put in the W 6x12 Marcy, leaving 12 more to go in to complete the set.

December 31. Feed was cut off the E and W mills at 8:30 PM and they were run empty for 24-hour shut down, starting 11:00 PM for New Year Holiday.

After cutting off feed a leak in the shell of #1 Marcy mill was repaired by arc welding.

WEIGHTOMETER TESTS

	West		East
12/6/41	1.51% Low	12/6/41	1.32% Low
13	.58% High	13	.53% High
20	No Check	20	.40% Low
27	.114% High	27	No Check

Average screen analyses, feed to flotation:

West Unit: 2.5% on 48-mesh; 10.6% on 65-mesh; 22.6% on 100-mesh; 50.2% on 200-mesh; all cumulative.

East Unit: 3.4% on 48-mesh; 12.4% on 65-mesh; 24.3% on 100-mesh; 51.0% on 200-mesh; all cumulative.

Mr. C. E. Taylor-----Mill Repairs & Changes---December 1941

POWER FOR GRINDING---KWH PER TON

	West	East	Total
Dry Tons Ore Crushed	19302.6	19352.2	38654.8
Telsmiths	.245	.199	.222
Gyraspheres	.681	.675	.678
6x12 Marcys	3.346	3.240	3.293
Hardinge Mill	.928	.926	.927
4x10 Marcys	3.550	3.504	3.527
TOTAL	8.750	8.544	8.647

WATER FOR FLOTATION

	Average	Maximum	Minimum
Turbidity	31	70	11
pH	7.3	7.5	7.2
Temperature, F.	58	67	48

Total rainfall 3.26". Maximum .94" 12/4/41.
Total days operating time 22-1/3.

TIME LOST FOR REPAIRS, BASED ON TELSMITH RUNNING TIME

East Unit:

12/1/41	10 Minutes; Starting up 5 min, power interruption 5 min.
6	Feed off at 7:00 AM for week end & repairs.
8	5 Minutes; Starting up.
10	40 " ; Gyrasphere crusher oil pump out of order.
13	Feed off at noon for week end.
15	5 Minutes; Starting up.
20	Feed off at 7:00 AM for repairs & week end.
22	10 Minutes; Starting up 5 min, 4x10 Marcys overloaded 5 min, 6x12 Marcy by-passed 10 min plate loose on dipper.
24	2 Hours 35 Minutes; Power interruption 5 min, shutting down for Christmas Holiday 2 hrs 30 min.
26	5 Minutes; Starting up.
27	Feed off at noon for week end.
29	50 Minutes; Starting up 5 min, opening Gyrasphere crusher 45 min.
31	2 Hours 30 Minutes; Shutting down for New Year Holiday.

West Unit:

12/1/41	10 Minutes; Starting up 5 min, power interruption 5 min.
3	10 " ; By-passing 6x12 Marcy to tighten shell liner bolts. 6x12 Marcy down 30 min.
6	Feed off at noon for week end.
8	5 Minutes; Starting up.
12	6x12 Marcy by-passed 25 min plugging hole in shell.
13	Feed off at 7:00 AM for repairs & week end.
15	5 Minutes; Starting up.
16	6x12 Marcy by-passed 10 min tightening bolt.
17	" " " " 25 " shell liner bolt out.

Mr. C. E. Taylor-----Mill Repairs & Changes---December 1941

12/18/41 20 Minutes; Tightening set collar on 6x12 drag shaft & tightening 6x12 Marcy shell liner bolts.
19 6x12 Marcy by-passed 1 hr 10 min in 2 stops putting in new shell liner bolts.
20 Feed off at noon for week end. 6x12 Marcy by-passed 20 min plug out of mill.
22 5 Minutes; Starting up. Tightening shell liner bolts in 6x12 Marcy 20 min.
23 6x12 Marcy by-passed 15 min tightening shell liner bolts.
24 2 Hours 35 Minutes; Power interruption 5 min, shutting down for Christmas 2 hrs 30 min.
26 5 Minutes; Starting up.
27 Feed off at 7:00 AM for repairs & week end.
29 20 Minutes; Starting up 5 min, 4x10 Marcy overloaded 10 min, tightening head liner bolt in #1 Marcy 5 min.
30 15 Minutes; Tightening shell liner bolts in 6x12 Marcy 10 min, #2 Marcy mill feed screw belt off 5 min, #2 Marcy by-passed 45 min feed screw choked.
31 2 Hours 30 Minutes; Shutting down for New Year Holiday.

Hardinge Mill:

12/1/41 15 Minutes; Starting up 5 min, feed pump drive belt broken 10 min.
3 1 Hour 30 Minutes; Feed pump choked.
6 Feed off at 7:30 AM for repairs & week end.
8 20 Minutes; Starting up.
13 Feed off at noon inspecting lining & week end shut down.
15 20 Minutes; Starting up.
20 Feed off at 7:30 AM patching lining & week end shut down.
22 1 Hour 45 Minutes; Completing repairs of 12/20.
24 2 " 30 " ; Shutting down for Christmas.
26 10 Minutes; Starting up.
27 Feed off at 4:00 AM, bolt out of lining. Started relining the mill.
29 24 Hours; Relining mill.
30 16 Hours 15 Minutes; Relining mill, feed on at 3:15 PM.
31 2 " 30 " ; Shutting down for Christmas.

(Signed) L. J. Weintz

Installed	Removed	Working Life	New or Used	Cost	Dry Tons Conveyed	Cost Per Dry Ton Conveyed	Remarks.
10-27-27	9-4-28	10 mo 7 days	New				2-14-28 Cut 1½" off of upper edge ½" x 4 x 36" Soft Steel.
9-4-28	4-7-30	19 mo 3 days	New				½ x 4" x 36" Soft Steel.
4-7-30	9-12-32	29 mo 5 days	New				½ x 4" x 36" Soft Steel.
9-12-32	11-4-35	37 mo 22 days	37 New	$19.32	215,984	$.00008945	½ x 4" x 36" Soft Steel. Active service 13 mo 11 days
11-4-35	7-27-36	8 mo 23 day	New				½ x 4" x 36" Soft Steel.
7-27-36	10-30-36	3 mo 3 days	37 New	$18.49	60,382	$.0003062	½" x 4 x 36" Soft Steel. 754.8 lbs @ $2.45 per 100 lbs.
10-30-36	5-22-37	6 mo 22 days	97 New				½ x 4 x 36" Soft Steel.
5-22-37	11-4-37	5 mo 12 days	65 New 32 New				65 - ½" x 4" x 36" soft steel. 32 - ⅜ x 4" x 36" - 1045 steel.
11-4-37	11-17-38	12 mo 13 days	97 old 49 New	$82.41	455,034	$.00081107	49 - ½ x 4" x 36" - 1045 Steel. Total life 17 mo 25 days. Cost is for metal only
11-17-38	7-27-39	8 mo 10 days	145 New	$73.21	228,320	$.0003206	⅜ x 4" x 36" - 1045 steel. Cost is for metal only
7-27-39	11-29-41	2 yrs 2 Mo. 24 Da	145 New	$73.44	670875	.00010946	⅜" x 4 x 36" - 1045 Steel Cost is for metal only
11-29-41			142 New				142 - NEW ⅜ x 4 x 36 - 1045 Steel Edge Flame Hardened 286 Links

BERTHA MINERAL DIVISION
THE NEW JERSEY ZINC COMPANY

DATE | SCALE

FLIGHT RECORD WEST 6x12 DRAG CLASSIFIER.

DR. | TR. | CHARGE

8GB 2057

W 6x12 DRAG TAIL SPROCKETS

Installed	Removed	Working Life	New or Used	Cost	Dry Tons Conveyed	Cost Per Dry Ton Conveyed	Remarks.
10-27-27	4-7-30	29mo 10days	2 New				$2\frac{15}{16}$" ϕ Tail Shaft Shaft broke 4-7-30
4-7-30	9-12-32	29mo 5days	2 New				$2\frac{15}{16}$" ϕ Tail Shaft
9-12-32	3-1-33	5mo 19days	2 Used				$2\frac{15}{16}$" ϕ Tail Shaft.
3-1-33	8-28-35	29mo 27days	2 New				$2\frac{15}{16}$" ϕ Tail Shaft.
8-28-35	5-7-36	8mo 9days	2 New	#109.36			New $2\frac{15}{16}$" ϕ Shaft. Sprockets loose on shaft.
5-7-36	10-30-36	5mo 23days	2 Used				$2\frac{15}{16}$" ϕ New Shaft.
10-30-36	12-13-36	1mo 13days	3 Used				$2\frac{15}{16}$" ϕ Shaft Shaft Broke 11-9-36 shaft broke 12-13-36
12-13-36	11-4-37	10mo 21days.	3 New				$3\frac{1}{16}$" Shaft. Keyway in the center. Shaft broke 8-19-37. New $3\frac{1}{16}$" Shaft Key on outer sprocket.
11-4-37	11-17-38	12mo 13days	Used	—	321,897	—	$3\frac{1}{16}$" ϕ Shaft. Keyway on outer sprocket.
11-17-38	7-27-39	8mo 10days	3 New	#187.60	228,320	#.0008217	Sprockets bought on GB 1527, 5-20-37 $3\frac{1}{16}$" ϕ Shaft.
7-27-39	1-14-40	5mo 17days	2 New	#135.06	149,375	#.00090417	Sprockets bought on GB 1862, 12/17/38 $3\frac{1}{16}$" ϕ Shaft
1-14-40	2-26-40	1mo 12days	2 New	#135.06	36,881	#.00366205	Sprockets bought on AGB 3158, 7/21/39
2-26-40	11-29-41	1YEAR 7mo-16Da	2 Tractron Wheels	#135.06 ESTI.	484,879	.0002785	$3\frac{1}{16}$" ϕ Shaft. Traction Wheels made from old used tail sprockets.

BERTHA MINERAL DIVISION
THE NEW JERSEY ZINC COMPANY

DATE | SCALE

TAIL SPROCKET RECORD
WEST 6x12 DRAG CLASSIFIER.

DR. | TR.

CHARGE

8GB2055

IW-6X12 DRAG-HEADSPROCICETS

Installed	Removed	WORKING Life	New or Used	Cost.	Dry Tons Conveyed	Cost per Dry Ton Conveyed	Remarks.
8-6-40	10-8-40	2 mo 2 day.	2 Used.	—	40,625	—	Mn Steel Single Pitch on 4" sq shaft Not worn out. 4.063 pitch.
10-8-40	5-3-41	6 mo 25 da.	2 New	# 157.34 Overhead included.	170,546	# .00092257	1 1/4" Pt sprockets made in Austinville. Mounted on 3 15/16" ϕ Shaft. Single pitch. 4.18" pitch. - Cost - Labor 91.21 Overhead 25.54 Plates # 40.59.
5-3-41	11-29-41	5 Mo-25 Da	2 New Solid Rims Cast Iron Removable.	# 311.01	133,634	.002327	Solid 1" Pt centers, Cast Iron Hubs Mounted on used 3 15/16" ϕ Shaft made from old square shaft. Single pitch. 4.31" Cost 5t Pt - 21.45 Bolts + Nuts 6.24 Labor plus overhead # 141.99 - CI Rims 15.01 Patt. 52.42 freight 2.33. Lumber $ 6.13. C.I. Hubs 14.94

BERTHA MINERAL DIVISION
THE NEW JERSEY ZINC COMPANY

DATE | SCALE

HEAD SPROCKET RECORD
WEST 6x12 DRAG CLASSIFIER.

DR. | TR.

CHARGE

8GB2053-A

I-W Drag Classifier Chain Record

Chain Numbers	Installed	Removed	Life. Working Time	Chain Composition	Cost	Dry Tons Conveyed	Cost per Ton Conveyed.	Chain Speed.	Remarks.
1	10-27-27	4-7-30	29 mo 10 days	Plain Links Attachments - F8 pr. Couplers.				60 ft/min	2 Strand #124 Ewart Mn Steel Chain Flights " ctrs. 10-27-27 New Head and Tail Sprockets installed. 2-14-28 Cut 1½" off of upper edge of flights. 9-4-28 Installed new set of flights.
2	4-7-30	3-1-33	34 mo 24 days	362 Plain Links @ .3337 = 120.80 92 F-8 Attachments .6505 = 59.85 2 pr Couplers 1.404 2.82	#183.47	551,061	#.0003329	60 ft/min 4-7-30 48 ft/min 11-5-30	2 Strand #124 Ewart Mn St Chain, Flights " ctrs. 4-7-30 Installed new head and tail sprockets and ½×4×36" soft steel flights. 9-12-32 Installed new set of ½×4×36" soft steel flights. 2 used tail sprockets 2-3-33 Installed used head sprockets and shaft. 11-5-30 Changed speed from 60 ft/min to 48 ft/min. 12-26-32, 2-1-33 } Chain broke. 2-17-33 Chain came apart due to wear.
3	3-1-33	11-5-35	32 mo 4 days	366 Plain Links 74 F8 Attachments 2 pr Couplers.	#172.08	129,309 130,775	#.0013308		2 Strand #124 Ewart Mn St. Chain. Flights 24" ctrs. 3-1-33 Installed new tail sprockets and shaft. 8-28-35 Installed new tail sprockets and shaft. 11-4-35 Installed new set of flights ⅝×4×36" Active Service life 7 mo 26 days
4	11-5-35	10-30-36	11 mo 25 days	352 Plain Links .35 = 123.20 74 F8 Attachments .72 = 53.28 2 pr. Couplers 1.53 3.06	#179.54	219,933	#.00081634		2 Strand #124 Ewart Mn St. Chain Flights 24" ctrs. 11-5-35. Installed 2 new head sprockets on used shaft. 5-7-36 Installed 2 used tail sprockets on new shaft. 7-27-36 Installed new set of flights ½×4×36". soft steel. 9-9-36 Drag wrecked due to defective chain.
5	10-30-36	12-19-36	1 mo 19 days	576 Plain 291 F8 Attach. 3 pr Couplers	No cost used chain	26,050	——	104 ft/min	3 strand #124 Ewart Mn St. Chain. Flights 12" ctrs. Used chain from 1E + 1W drags - 10-30-36 Installed 3 used tail sprockets on new shaft. - 3 used head sprockets on used shaft. 97 new ½×4×36" soft steel flights. 11-9-36 Installed 2-20T idler sprockets to hold chain to bottom of drag. 12-13-36 - 2 1/16" Tail shaft broke. 3 New Sprockets on 3 11/16 Shaft with Keyway on the side. Chain broke 11-8-36, 12-3-36, 12-11-36 12-12-36 12-13-36 12-17-36
6	12-19-36	11-4-37	10 mo 15 days	582 Plain @ .34 = 197.88 294 Attach. F-8 .72 = 211.68 3 pr. Couplers 1.53 = 4.54	#414.15	255,687	#.001620	104 ft/min	3 Strand #124 Ewart Mn St Chain Flights 12" ctrs. 12-19-36 Installed 3 new head sprockets and shaft. 5-22-37 Installed new set of flights. Each 3rd flight ⅜×4×36" - 1045 steel. - other 65 flights ½×4×36" soft steel. 7-2-37 Installed 2 new 20 T Idler Sprockets. 8-19-37 - 3 11/16" # Tail Shaft Broke. 10-7-37 Installed 3 used head sprockets on used shaft. 8-12-37 Chain broke. 9-28-37 + 10-4-37, 10-23-37 7-10-37 Lined classifier bottom.
7	11-4-37	11-17-38	12 mo 13 days	432 Plain @ .34 = 146.88 438 Attach. F8 @ .78 = 341.64 3 pr. Couplers. 1.40 = 4.20	#492.72	321,897	#.0015307	60 ft/min.	3 Strand #124 Ewart Mn St. Chain. Flights 8" ctrs. 11-4-37 Chain speed changed to 60 ft/min Installed new head sprockets and shaft and used tail sprockets. Added 49 - ¼×4×36" flights 1045 steel. 9-15-38 - Installed 2 new 20T idler sprockets. Chain broken 11/3/38 - 11/14/38 - 11/15/38
8	11-17-38	7-27-39	8 mo 10 days	432 Plain @ .35 151.20 435 F-8 Attach. @ .79 = 343.65 3 pr. Couplers @ 1.61 = 4.83	#499.68	228,320	#.0021885	60 ft/min	3 strand #124 Ewart Mn St. Chain Flights 8" ctrs. 11-17-38 Installed 3 new head and tail sprockets on new shafts. 145 - new ⅜×4×36 flights 1045 steel. Chain broken 2/7/39, - 2/28/39, - 3/5/39, - 3/30/39 ; 6/3/39 ; 6/8/39 ; 7/21/39
9	7-27-39	1-14-40	5 mo 17 days	290 Plain @ .4809 = 139.47 290 F-2 Attach. @ .7374 = 213.86	#353.33	149,375	#.002365	60 ft/min	2 Strand 4124 Pintle Chain - File Hard Promal. - Flights 8" ctrs. - 7-27-39 Installed 2 new Head Sprockets 2 new tail sprockets, 2 new idler sprockets 145 new ⅜×4×36" flights - 1045 steel. Chain bought on AGB 2921 dated 6/21/39 Chain removed because wear increased pitch till it would not stay on tail sprockets.
10	1-14-40	7-27-40	6 mo 13 days	290 Plain 139.47 292 F-2 Attach. 216.39.	#355.86	169,339	#.002096	60 ft/min	2 strand 4124 Pintle chain - File Hard Promal - Flights 8" ctrs. 1-14-40 Installed 2 new head sprockets on used shaft. 2 new tail and idler sprockets. 2-15-40 Installed 3 sets of idler sprockets under return chain 2-28" Dia. Traction Wheels in place of idler sprockets to hold down chain. 2-26-40 Installed 2 Traction Wheels in place of tail sprockets. Traction wheels made from old tail sprockets. 3-26-40 Installed spare head sprockets with double pitch. 7-27-40 Removed chain - chain jumping teeth. 7-16-40 - Repaired 3 supporting idlers under Top Chain. Chain bought on AGB 3497 dated 9/19/39.
9	7-27-40	2-14-41	6 mo 17 days 5 mo 17 days 12 mo 4 days	290 Plain 290 Attach. F2 (5 mo 17 days Previous Use.)	Set of Pins #110 35 3.33 = 463.33	158,445 149,375 307,820	#.00069 + 25 = Pins #.0015052	60 ft/min	2 Strand 4124 Pintle chain - File Hard Promal - Flights 8" ctrs. - Chain removed 1-W 1-14-40 reinstalled with new pins. 8-6-40 Installed used single pitch head sprockets, - 10-8-40 Installed 4.18" pitch head sprockets made in Austinville. Chain broke 2/17/41. Link wore through.
#10	2-14-41	11-29-41	7 Mo 25 Da 6" 13 1 yr. 2 Mo. 8 Da	286 Plain 286 Attach. - F2 (6 mo 13 days Previous Use)	Used #10 Chain $335.86	194,224 169,339 363,563	.00097881	60 ft/min.	2 Strand 4124 Pintle chain - File Hard Promal - Flights 8" ctrs. Chain removed from 1W 7-27-40. due to jumping teeth on head sprockets of standard pitch. - Sprockets at start fitted with 4.18" Pitch. 8/3/41 Changed Head Sprocket 4.31" ⌀ Solid cast iron demountable rims cast at Palmerton.