

THE CLEVELAND-CLIFFS IRON COMPANY

Ore Mixing Department

ANNUAL REPORT OF GENERAL MANAGER

For Year Ending December 31, 1949

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THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT

Manager's Annual Report Year 1949

INDEX

	<u>PAGE NO.</u>
Mr. C. J. Stakel's report to the president	1-13
Comparative statement of Michigan assessed valuation & taxes paid for the Mining Department and Cliffs Power & Light Company	14
Comparative cost of all explosives used at hard ore mines	15
Comparative cost of all explosives used at soft ore mines	16
Comparative cost of all mine timber used at soft ore mines	17
Total cost of supplies charged to "Cost of Ore at Mine"	18
Labor summary - all companies	19
Comparison of total days worked and tons of ore mined for the years 1949 and 1948	20
Statement of overtime for year 1949 and effect the penalty cost had on the year's production cost	21
<u>Ishpeming District</u>	
Cliffs Shaft Mine	22-70
Lloyd Mine	71-98
Mather Mine "A" Shaft	99-155
Morris Mine	156-169
Tilden Mine	170-182
<u>Negaunee District</u>	
Athens Mine	183-219
Cambria-Jackson Mine	220-250
Maas Mine	251-280
Mather Mine "B" Shaft	281-303
Negaunee Mine	304-318
<u>Iron River District</u>	
Spies Mine	319-344
<u>Mesaba District</u>	
Agnew Mine	345-352
Atkins Mine	353-360
Canisteco Mine	361-377
Hawkins Mine	378-390
Hill-Trumbull Mine	391-409
Holman-Cliffs Mine	410-431
Sargent Mine	432-439
Wanless Mine	440-443

Continued -

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THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT

Manager's Annual Report Year 1949

INDEX
Page 2

	<u>PAGE NO.</u>
<u>Safety Department</u>	
a. Fatal accidents	444-449
b. Non-fatal accidents	450-467
c. Safety inspection	468-489
d. Ventilation	490-500
e. Mine safety & mine rescue courses	501-505
f. Miscellaneous	506-508
<u>Mining Engineering Department</u>	
a. List of annual report map books	509-510
b. Map reports	510-511
c. Report on miscellaneous documents & abstracts	511-513
d. Engineering force	513-514
e. Distribution of time	515-518
f. Costs	519
h. Automobiles	519
i. Mines	519-521
j. Miscellaneous	521-524
<u>Mechanical Department</u>	
Agnew Mine	
Athens Mine	525
Atkins Mine	
Cambria-Jackson Mine	525-526
Canisteco Mine	
Cliffs Shaft Mine	526
General	530
Hawkins Mine	
Hill-Trumbull Mine	
Holman-Cliffs Mine	
Lake Mine deferred	526
Lloyd Mine	527
Maas Mine	527
Mather Mine "A" Shaft	527-528
Mather Mine "B" Shaft	528-529
Negaunee Mine	529
Sargent Mine	
Spies Virgil Mine	529
Tilden Mine	530
Comparative tables	531-532
<u>The Cliffs Power & Light Company</u>	
General operations	533-536
Statistical data	537-538
Substation transformers	539-541
Charts	542-545

Continued -

THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT

Manager's Annual Report Year 1949

INDEX

Page 3

	<u>PAGE NO.</u>
<u>Welfare Department</u>	
General	546-547
11-a. Workmen's compensation	548-555
c. Group insurance	556-559
23-a. Pension system	560-564
b. Republic mine funds	565
c. Suspense funds	565
d. Visiting nurses	566-569
f. North Lake Club	570
g. Gwinn Association	570
h. Ishpeming Y. M. C. A. building	571
i. Safety work	572
j. Hospitals and medical service and Ishpeming Hospital	573-592
k. Community health	593
l. Red Cross	595
m. Relief work	594
n. Employment	594
o. Incapacitated employes	596-601
p. Cost of living	595
q. Improvement work	602
r. Gardens and well-kept premises	602
s. Community service work	602
t. Clubs	602
u. Outdoor activities	602
v. Mather Inn	603
w. Various departments and activities	603-605
x. Police Department	603
y. "The Cleveland-Cliffs Orbit"	606
z. Appreciation	606
<u>Electrical Department</u>	
Athens Mine	607
Cambria-Jackson Mine	607-608
Cliffs Shaft Mine	608
Lloyd Mine	609
Maas Mine	609
Mather Mine "A" Shaft	610
Mather Mine "B" Shaft	610
Negaunee Mine	610-611
Spies Mine	611
General	611
<u>Report of Geologist</u>	
a. Staff	
b. General description of the work of the department	
c. Surface geological surveys	
d. Mine geological surveys and operations	
e. Options and leases	
f. Explorations and cost	
g. Description of explorations	
h. Examination of mineral land offers	
l. Metallurgical tests and experiments	
j. Expense statements	

THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT

Manager's Annual Report Year 1949

GROSS INDEX BY MINES

	Athens	Cambria- Jackson	Cliffs- Shaft	Lloyd	Maas	Mather	
						"A"	"B"
<u>Ishpeming, Negaunee, and Iron</u>							
<u>River Districts:</u>							
General	183-184	220	22-23	71	251	99	281-297
Production, shipments & inventories	184-188	220-222	24-28	71-74	252-254	100-102	
Analysis	188	222	29	74-75	254	102	
Estimate of ore reserves	188-189	223	30-32	75-76	255-256	103-104	297
Labor and wages	190-191	223-224	33-34	76-78	256-259	105-108	297-298
Surface	192-194	225-227	35	78-79	259-260	109-111	
Underground	194-204	228-236	35-56	79-87	261-269	112-131	
Cost of operating and/or opening	204-213	237-243	57-66	87-91	270-276	132-141	
Explorations		244-245	66-67	92		142-150	298-301
Taxes	214	245	67-68	92	276	151	301
Accidents & personal injuries	215	245-246	68	93-94	277-278	152	302
New construction or equipment	216-217	246-248	68-69	94-95	278-280	153	
Maintenance & repairs	217-218	248-249	69	95-97		154	
Power	218	249-250	70	97	280	154	
Nationality of employes	219	250		98		155	303
Water supply				97-98		155	
Condition of premises	218-219	250		98	280		

	Morris	Negaunee	Spies	Tilden
<u>Ishpeming, Negaunee and Iron</u>				
<u>River Districts:</u>				
General	156	304	319	170
Production, shipments & inventories	156-158	304-306	319-322	170-172
Analysis	159	306	322	172
Estimate of ore reserves	159-160	306	322-323	172-174
Labor & wages	160	306-307	323-325	174-175
Surface	161-163	308	325	
Underground or open pit operations	163-169	309-314	326-334	175-178
Cost of operating		315	335-338	178-181
Explorations		315	338-339	
Taxes		316-317	339-340	182
Accidents & personal injuries		318	340-341	182
New construction or equipment		318	341-342	182
Maintenance & repairs			342-343	
Power			344	
Condition of premises			344	
Nationality of employes			344	
Water supply			344	

Continued -

THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT

Manager's Annual Report Year 1949

CROSS INDEX BY MINES

Page 2

	Agnew	Atkins	Canisteo	Hawkins
<u>Mesaba District:</u>				
General	345	353	361	378-379
Production, shipments and inventories	345-346	353-354	362-363	379-380
Analysis	346	354-355	363-364	380
Estimate of ore reserves	346-347	355-356	364-366	381-382
Labor and wages	347	356	366	382
Surface	347	356	367	383
Underground and open pit operations	348-349	357-358	367-370	383-385
Cost of operating	349-351	358-359	373-374	387-388
Explorations	351	359	375	389
Taxes	351	359-360	375-376	389
Accidents and personal injuries	352	360	376	390
New construction or equipment	352	360	377	390
Maintenance and repairs	351	358	373	387
Nationality of employes				
Water supply				
Sewer system				
Condition of premises				
Gwinn Association				
Beneficiation			370-372	385-386

	Hill- Trumbull	Holman- Cliffs	Sargent	Wanless
<u>Mesaba District:</u>				
General	391-392	410-411	432	440
Production, shipments and inventories	392-394	411-415	432-433	
Analysis	394-396	413	433	
Estimate of ore reserves	396-397	415-417	433-434	440
Labor and wages	398	417	434	441
Surface	398	417-418	434	441
Open pit and underground	398-400	418-421	435-436	441-442
Cost of operating	404-405	426-428	436-437	442
Explorations	406	428-429	438	443
Taxes	406-407	429-430	438	443
Accidents and personal injuries	407-408	430	438-439	443
New construction or equipment	409	430	439	443
Maintenance and repairs	403-404	425	437	442
Pumping				
Beneficiation	401-402	421-425		

Ishpeming, Michigan
February 28, 1950

Mr. A. C. Brown, President
Cleveland, Ohio

Dear Sir:-

The Ore Mining Department in 1949 continued to try to improve every conceivable measure to increase efficiency and lower costs in the Michigan and Minnesota Mines and plants.

In Michigan further advancements were made with respect to the hydro-mucker, tungsten carbide bits, long hole ring drilling with jointed rods, steel sets, and reinforced concrete lagging, block caving, and lighter drilling machines.

On the Mesaba Range after repeated trials and changes the Hill Trumbull heavy density plant at long last produced a low silica concentrate after substituting a Hardinge concentrator for the Akins classifier. Sub level caving was introduced at the underground properties with results satisfactory to both the Company and the fee owners. Experiments were also conducted with torque converters on the heavy haulage ore and stripping units. At the Sargent a new production plan was inaugurated by the production of crude wash ore from the underground workings.

PRODUCTION & SHIPMENTS

Production

Production for the five year period beginning with 1945 follows:

<u>Year</u>	<u>Michigan Mines</u>	<u>Minnesota Mines</u>	<u>TOTAL</u>
1945	3,542,802*	2,376,286*	5,919,088
1946	2,730,496*	1,642,184*	4,372,680
1947	4,162,545*	3,767,682*	7,930,227
1948	4,112,679	4,595,354	8,708,033
1949	3,675,240	3,461,590	7,136,830

* These figures do not include previous years stockpile overrun.

The 1949 output was curtailed by a six weeks strike.

The 1949 production by grades is split as follows:

Michigan

Non-Bessemer Standard	3,210,572 tons
Non-Bessemer Special	311,723 "
Silicious	152,945 "
Total	<u>3,675,240 tons</u>

Production (Cont.)

Minnesota

Non-Bessemer	2,699,123 tons
Bessemer	<u>792,467 "</u>
Total	3,461,590 tons

Shipments

Shipments from the underground mines and open pits in Michigan and Minnesota in 1949 were, viz:

Michigan Mines	3,483,684 tons
Minnesota Mines	<u>3,561,306 "</u>
Total	7,044,990 tons
Total shipments in 1948 were	8,770,652 tons
Total shipments in 1949	<u>7,044,990 "</u>
Decrease (due to 6 weeks strike)	1,725,662 tons

Analysis

Statement Showing Lower Lake Results Compared with Mine
Analysis on Tonnages Sampled by Lake Erie Chemists
Season 1949

MICHIGAN ORES

Grade		Railroad Tons	Iron Dried	Phos.	Moist.	Iron Natural
Cliffs Shaft Lump	Mine	343,448	60.32	.100	.28	60.151
	Lower Lakes		60.34		.32	60.147
	Expected		59.50	.105	.40	59.262
Belden	Mine	525,172	57.03	.102	11.53	50.454
	Lower Lakes		56.71		10.98	50.483
	Expected		56.80	.100	11.22	50.430
Cliffs Group via Escanaba	Mine	183,310	57.25	.161	10.38	51.307
	Lower Lakes		57.57		10.55	51.496
	Expected		57.11	.167	10.68	51.010
Cliffs Group Harvester	Mine	110,145	58.19	.113	12.32	51.021
	Lower Lakes		58.07		11.62	51.322
	Expected		57.99	.111	12.06	51.000
Cliffs Group Bethlehem	Mine	202,706	58.02	.110	12.35	50.855
	Lower Lakes		57.92		11.28	51.387
	Expected		57.99	.111	12.06	51.000
Cliffs Group J. & L.	Mine	300,189	57.98	.108	12.35	50.819
	Lower Lakes		57.95		11.79	51.118
	Expected		57.99	.111	12.06	51.000

<u>Grade</u>		<u>Railroad</u> <u>Tons</u>	<u>Iron</u> <u>Dried</u>	<u>Phos.</u>	<u>Moist.</u>	<u>Iron</u> <u>Natural</u>
Cliffs Group	Mine	821,463	57.96	.111	12.29	50.837
Hanna, Republic	Lower Lakes		57.90		11.59	51.189
	Expected		57.99	.111	12.06	51.000
Cliffs Group	Mine	215,066	57.87	.110	12.30	50.752
Algoma	Lower Lakes		57.67		11.74	50.900
	Expected		57.99	.111	12.06	51.000
Tilden Sil.	Mine	69,351	39.89	.039	1.70	39.212
	Lower Lakes		40.06		2.20	39.179
	Expected					
Tilden Low Phos.	Mine	9,325	36.40	.014	1.34	35.912
	Lower Lakes		36.38	.013	1.16	35.958
Virgil	Mine	42,842	56.08	.325	8.08	51.549
	Lower Lakes		56.32		7.97	51.831
	Expected		56.01	.352	8.21	51.410

<u>Mine analyses</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Moist.</u>	<u>Iron Nat.</u>
In Belden for Inland	245,396	57.96	.110	10.16	.072	12.34	
Republic, Hanna, etc.	821,463	57.96	.111	10.09	.061	12.29	
Bethlehem	202,706	58.02	.110	9.91	.063	12.35	
Pickands Mather	238,697	57.96	.110	10.14	.061	12.34	
Algoma Steel Corp.	215,066	57.87	.110	10.13	.064	12.30	
Wisconsin Steel Co.	110,145	58.19	.113	9.83	.062	12.32	
Jones & Laughlin	300,189	57.98	.108	10.02	.061	12.35	
Escanaba-Misc.	183,310	57.25	.161	9.63	.064	10.38	
Mine - Dried	2,316,972	57.91	.114	10.03	.063	12.16	50.868
Expected - "		57.81	.122	10.12	.077	11.78	51.000
Guarantee		58.01	.122	9.98	.078	11.57	51.300

<u>Comparison of Mines and Lower Lakes</u>							
Total Belden - Mine		525,172	57.03			11.53	50.454
	L.L.		56.71			10.98	50.483
	Expected		56.80			11.22	50.430
Republic, Hanna, etc.		821,463	57.96			12.29	50.837
	L.L.		57.90			11.59	51.189
Bethlehem	Mine	202,706	58.02			12.35	50.855
	L.L.		57.92			11.28	51.387
Algoma	Mine	215,066	57.87			12.30	50.752
	L.L.		57.67			11.74	50.900
Wisconsin	Mine	110,145	58.19			12.32	51.021
	L.L.		58.07			11.62	51.322
J. & L.	Mine	300,189	57.98			12.35	50.819
	L.L.		57.95			11.79	51.118
Escanaba	Mine	183,310	57.25			10.38	51.307
	L.L.		57.57			10.55	51.496
Average	Mine	1,832,879	57.90	10.00		12.12	50.883
"	L.L.		57.86			11.50	51.206
Expected			57.99	10.14		12.06	51.000
Guarantee			58.01	9.98		11.57	51.300

Silicious Ores Used in Cliffs Group
1949

<u>Customer</u>	<u>Tonnage</u>	<u>C.S.Crushed</u>	<u>Lloyd 2</u>	<u>Total</u>	<u>Percent</u>
Belden-Inland	245,396	11,361	3,971	15,331	6.25
Republic, Hanna	821,463	36,484	6,418	42,902	5.22
Bethlehem	202,706	9,062	1,239	10,301	5.08
Pickands Mather	238,697	12,484	2,869	15,353	6.43
Algoma	215,066	8,808	3,694	12,502	5.81
Wisconsin	110,145	4,863	1,084	5,946	5.40
J. & L.	300,189	11,379	2,313	13,692	4.56
Escanaba	183,310	20,075	-	20,075	10.95
Total	2,316,972	114,515	21,586	136,101	5.87
		4.94%	.93%	5.87%	
Total	3,001,944	168,639	108,387	277,026	9.23
		5.62%	3.61%	9.23%	

Comparison of Output - Cliffs Group Ores

<u>Grade</u>	<u>Iron Expected</u>	<u>Iron Actual</u>
Cliffs Shaft crushed	51.00	50.83
Lloyddale	59.00	58.82
Lloyd silica	52.50	52.72
Negaunee	57.50	55.97
Negaunee-Maas	57.50	56.60
Maas Standard	59.00	58.77
Maas Special	59.20	58.61
Mather	58.50	58.17
Athens	59.00	58.60
Cambria Jackson	58.75	58.66
Spies	57.70	57.72

MINNESOTA ORES

<u>Grade</u>		<u>Railroad Tons</u>	<u>Iron Dried</u>	<u>Phos.</u>	<u>Moist.</u>	<u>Iron Natural</u>
Newberry Bess.	Mine	163,192	56.332	.037	6.863	52.466
	Lower lakes		56.463	.037	6.676	52.694
Newberry Bess. J. & L.	Mine	345,907	56.963	.037	7.338	52.783
	Lower Lakes		57.001	.037	7.079	52.966
Williamson G.N.	Mine	586,604	56.006		8.548	51.219
	Lower Lakes		56.173		8.206	51.563
Williamson J&L	Mine	727,774	56.151		8.298	51.492
	Lower Lakes		56.249		8.079	51.705
St. Paul G.N.	Mine	643,809	55.051		11.702	48.609
	Lower Lakes		55.348		11.373	49.053
Ralph G.N.	Mine	153,147.	51.814		11.794	45.703
	Lower Lakes		51.946		11.387	46.031
St. Paul Special	Mine	315,047	56.362		10.305	50.554
	Lower Lakes		56.246		10.549	50.313

It will be noted that if one compares the lower lake analyses with the mine analyses the bulk of the tonnage forwarded to lower lakes indicates a higher iron natural obtained by Lake Erie chemists. In other words, the mine analyses are on the conservative side.

COSTS

Michigan Underground Mines
Year 1949

<u>Mine</u>	<u>Production</u>	<u>COST OF PRODUCTION</u>		<u>TOTAL COST</u>	
		<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>
Athens	550,000	\$ 2.881	\$1,584,673.90	\$ 3.408	\$1,863,839.40
Cambria Jackson	434,210	2.411	1,046,968.20	2.736	1,187,990.10
Cliffs Shaft	492,405	4.114	2,025,820.44	4.559	2,244,904.80
Maas	603,306	2.967	1,790,236.36	3.298	1,989,724.40
Mather A	1,062,164	2.844	3,020,270.76	3.327	3,533,849.28
Negaunee	86,676	4.105	355,829.78	4.612	399,743.49
TOTAL	3,228,761	3.043	9,823,799.44	3.475	11,220,051.47

Year 1948

Athens	506,600	3.456	1,750,725.02	3.979	2,015,892.26
Cambria Jackson	491,817	2.331	1,146,581.56	2.750	1,352,292.56
Cliffs Shaft	602,453	3.734	2,249,811.54	4.208	2,535,136.20
Maas	673,126	3.017	2,030,645.06	3.415	2,298,892.10
Mather A	1,001,001	3.024	3,027,193.66	3.483	3,486,753.82
Negaunee	382,076	2.804	1,071,402.60	3.070	1,173,050.71
TOTAL	3,657,073	3.083	11,276,359.44	3.517	12,862,017.65

1949

Decrease in Product	428,312		
Decrease in Cost		.040	.042
Percentage	11.7%	1.3%	1.2%

Decrease in production due to three causes:

1. Negaunee Mine went out of production April 27, 1949.
2. All mines changed from 6 days to 5 days per week operation June 27 and on August 29th Spies dropped to 4 days per week.
3. All mines were closed from October 1st to November 13th inclusive due to strike.

Despite the fact that we had a six weeks strike late in the fall and early in the winter of 1949 and also keeping in mind that there was an upward wage adjustment amounting to 9% in the middle of July, 1948 nevertheless the foregoing tabulation indicates that the underground mines as a whole showed a decrease of \$.04 per ton in cost of production and a decrease of \$.042 per ton in the total cost at the mine. This indicates that the supervisory force was on its toes and by concerted effort despite the wage increase and strike, costs were held down.

LABOR

In general, in both Michigan and Minnesota, the over-all labor supply in 1949 was ample. In Minnesota we continued to have difficulty getting men suitable for underground mining. On the Marquette Range we continued to train young men to fill in the gaps in the ranks of miners.

The average number of employees at Michigan properties for the past year shows little change compared with 1948. In Minnesota we employed about 100 more than in the previous year. Detailed figures follow:

AVERAGE NUMBER OF EMPLOYEES

Michigan Properties

January 1948	3,001
July 1948	3,103
December 1948	3,109
January 1949	3,110
July 1949	3,073
December 1949	3,070

Minnesota Mines

March 1948	922
May 1948	1,045
September 1948	1,128
December 1948	1,080
March 1949	1,065
May 1949	1,141
September 1949	1,225
December 1949	1,187

The breakdown by mines follows:

Michigan Properties - 1949

	<u>January</u>	<u>July</u>	<u>December</u>	<u>Average for year</u>
Athens	335	343	338	323
Cambria Jackson	229	229	223	209
Cliffs Shaft	457	463	460	461
Lloyd	130	138	142	126
Maas	378	384	390	353
Mather A	635	633	675	589
Mather B	95	120	125	107
Negaunee	180	27	21	66
Spies	112	111	112	106
Tilden	3	30	15	15
Miscellaneous	78	83	78	71
General Storehouse & Shops	141	156	152	141
General Roll-Ishpeming	228	248	235	240
Cleveland	29	29	29	29
C.P. & L.Co. Plant	70	69	64	62
General	10	10	11	10
Total	<u>3,110</u>	<u>3,073</u>	<u>3,070</u>	<u>2,908</u>

Minnesota Properties - 1949

	<u>March</u>	<u>May</u>	<u>September</u>	<u>December</u>	<u>Average for Year</u>
Agnew	96	103	95	104	93
Atkins	73	54	44	25	45
Canisteo	204	178	211	220	169
Hawkins	160	153	147	171	135
Hill Trumbull	83	154	192	158	135
Holman Cliffs	220	251	261	198	200
Miscellaneous	45	40	43	37	41
Sargent	115	115	115	117	107
Wanless	-	22	36	75	46
General-Hibbing	52	54	64	65	58
Cleveland	17	17	17	17	17
Total	1,065	1,141	1,225	1,187	1,046

ORE RESERVES

	<u>Michigan Mines</u>		<u>Increase or Decrease</u>
	<u>12-31-48</u>	<u>12-31-49</u>	
Standard ores	18,338,212	17,902,934	435,278
High sulphur ores	6,971,648	6,353,177	618,471
Total	25,309,860	24,256,111	1,053,749

The foregoing indicates a decrease in ore reserves of a little over one million tons. The gains and losses for the individual mines follow:

Athens Mine	15,559 ton loss
Cambria Jackson	411,547 " "
Cliffs Shaft	100,427 ton gain
Lloyd	163,387 ton loss
Maas	374,258 " "
Mather	205,472 ton gain
Negaunee Mine	198,170 ton loss
Spies Virgil	196,727 " "
	<u>1,053,749 ton loss</u>

Although the decrease indicated a loss in ore reserves in 1949 by ore development and diamond drilling the new standard grade tonnage discovered amounted to 2,040,443 tons. Standard ore mined in 1949 totalled 3,094,192 tons. No mention is made of any silicious tonnage in any of the foregoing figures.

Ore Reserves (Cont.)

Mesaba Range

	<u>12-31-48</u>	<u>12-31-49</u>	<u>Increase or Decrease</u>
Agnew	1,277,199	996,798	280,401
Atkins	924,919	512,000	412,919
Canisteo	7,974,827	7,409,755	565,072
Hawkins	3,298,171	4,661,002	1,362,831
Hill Trumbull	1,443,845	1,845,486	401,641
Holman Cliffs	6,619,293	10,425,218	3,805,925
Sargent	1,447,384	1,132,043	315,341
Wanless	1,681,714	1,673,588	8,126
Bovey #1-Sally	1,500,000	1,507,801	7,801
Potter	-	409,487	409,487
Alworth Reserve	-	1,708,404	1,708,404
TOTAL	26,167,352	32,281,582	6,114,230

ELECTRIC POWER

Electric energy generated and purchased during 1949 amounted to 115,529,840 kilowatt hours, a total slightly less than the figure of 117,189,620 kilowatt hours for 1948. The strike, which took place in October and the first half of November, reduced sales and demands for power.

The hydro plants generated a total of 66,698,100 KWH; 30,006,500 KWH were generated by diesel and the balance of 18,825,240 KWH were purchased. The water conditions remained extremely bad from January until July. During July precipitation totalled 11.72", the heaviest on record. The year showed 37.23" in Ishpeming but the gauge at the Dead River Hoist showed 43.28". At the end of the year, the storage reservoirs held 24,000,000 KWH in reserve. A year previous we had only 4,359,000 KWH of stored water available.

By January 1st, 1949 foundations for the main structure at the new steam generating plant were in. No work was done during January, February or March but early in April actual construction above the foundations was started. By the end of the year enough progress had been made to insure a starting date of February 15, 1950 for a full test of both boiler and generator.

During 1949 many conferences were held in Cleveland and Lansing for a revision of the rate structure to compensate the company for the added expense of producing electric energy by diesel and steam plant. The Michigan Public Service Commission granted a temporary order effective July 1st approving an increase in rates on a temporary basis until December 31st. Late in the year an extension was given to use the increased rates until July 1st, 1950.

STRIKE

On May 16th, 1949, Philip Murray, President of the United Steelworkers of America-CIO, notified the Company that the Union desired to modify as of July 16th, the collective bargaining contract dated May 28, 1947 and the supplemental agreement dated Aug. 25, 1948. The Union offered to meet with the Company for the purpose of negotiating modifications to the contract and supplemental agreement to provide for a general and uniform change in rates of pay and for life, accident, health, medical and hospital insurance benefits. We were further advised that if the Company and the Union failed to reach mutual agreement on these issues by July 16, 1949 the agreement would terminate.

On May 23rd Philip Murray was notified by letter that his letter of May 16th had been received.

On June 2nd Henry Burkhammer notified the Company that Jack Powell of the United Steelworkers of America-CIO, District 33, would contact us as to the most convenient time and place for a meeting.

The next day, June 3rd, Jack Powell 'phoned and inferred that he was not anxious to meet with us prior to June 15th because of previous commitments with other companies.

On June 9th we notified Philip Murray that negotiations on behalf of The Cleveland-Cliffs Iron Company, Athens Iron Mining Company and Negaunee Mine Company would be restricted to two issues: (a) a general and uniform change in wage rates; and (b) program for life, accident, health, medical, and hospital insurance benefits. On the subject of employees' pensions upon retirement and disability, we did not regard his request to negotiate on that subject as being relevant or applicable under the terms of the agreement.

On June 14th the first negotiating meeting was held in the Ishpeming office with Jack Powell and representatives from six Marquette Range underground mines. No Minnesota representatives were in attendance at that meeting. The Union presented three objectives for our consideration:

1. A general wage increase
2. A request for adequate pensions
3. Improvement in the Company's program of social insurance

No specific amounts or costs or benefits were presented. At the end of that meeting Jack Powell tentatively set a date for the second meeting during the second week in July.

On July 14th negotiations were resumed with little accomplished except a proposition agreeable to both parties to extend the contract in force to August 1st.

On July 14th the public press announced that President Truman would set up a Steel Fact Finding Board to study the question of insurance and pensions with the understanding that if the companies and unions were agreeable to his proposal there would be a sixty day delay in the steel and iron ore strike.

JONES & LAUGHLIN WERE THE FIRST TO ACCEPT THE PROPOSAL. EVENTUALLY ALL COMPANIES AGREED IN SUBSTANCE ON SLIGHTLY DIFFERENT BASES.

On July 15th the Company gave notice to the Union of our election to defer the date after which the Union might resort to strike or the Company to lockout and the date for termination of our labor agreement to August 1st, 1949.

On July 20th the Union ordered all of their men in Upper Michigan, Wisconsin and Minnesota employed at the mines to stay on the job until September 14th. This action was taken because Philip Murray extended the time limit for the steel plants. Furthermore, representatives of our Company in New York City reached an agreement with the Union to an extension of the contract to September 14th. A supplemental agreement to accomplish this purpose was negotiated on July 27th by Messrs. Bell and Kerr.

On Friday, August 12th, most of the iron ore producing companies attended a meeting in Duluth, called by the Minnesota State Department of Conciliation. This meeting was informal and the Conciliator opened the meeting by stating it had been called in compliance with the law and he assumed little would be accomplished until after the Fact Finding Board appointed by the President had made its report. The meeting broke up without any action taken by either the Union or the companies.

Shortly thereafter the Michigan Union representatives notified the Michigan Labor Mediation Board that efforts to settle the dispute by mediation would be without avail and that the impending strike was due to the Company's failure to grant the Union's demands relative to wages, pensions and other forms of social insurance.

On September 6th the Company notified the Union of its election to defer the date after which the parties may resort to strike or lockout at its Michigan properties to 12:01 A.M. September 29, 1949. A similar notice for the Minnesota Mines was mailed on September 12th.

The next illegal step was the taking of a strike vote on September 10th. The vote on the Minnesota Ranges was conducted not by representatives of the State Mediation Board but by Union officials and most of the ballots read: "Do you wish to strike for a pension - Yes or No". In Michigan the vote was supervised by representatives of the Michigan Labor Mediation Board. By and large the vote on the Marquette Range was percentage-wise more against the strike than on the other ranges. The total No vote against the strike at Cleveland-Cliffs properties in Michigan was more than the combined total No vote of all the Inland Steel, North Range, Pickands Mather, M. A. Hanna, Oliver, Republic and Castile Mining Company properties. Mather A and Mather B voted against the strike.

Strike notices were put up on the bulletin boards at The Cleveland-Cliffs Iron Company and Mesaba Cliffs properties on the Mesaba and at the Maas Mine in Negaunee on September 29th, despite the scheduling of a resumption of negotiations with the Union on September 28th, at which time Jack

Powell signed a supplemental agreement deferring the strike to October 1, 1949. It was further mutually agreed that negotiations were to be resumed on September 30th.

On Friday, September 30th, the Company proposed that the Company contribute toward a package plan for life, accident, health, medical and hospitalization insurance benefits and to provide a satisfactory pension retirement program 10¢ per hour per employee, less credits for similar payments the Company is already making. It was also proposed whether contributions were to be made by employees should be subject to negotiation between the Union and the Company.

Jack Powell and the Committee agreed that the proposition seemed to have settled the issues in dispute.

It was agreed the meeting adjourn to permit the Company to draw up its proposal in the form of a supplemental agreement to be signed by the Union and the Company.

In the afternoon, upon resumption of the negotiations, Jack Powell admitted he had to renig and advised the local Unions were not permitted to deviate from the Union's national policy demands and the strike would be called starting at 12:01 A.M. Saturday, October 1st.

The strike continued for six weeks with production resumed at the underground mines on Monday, November 14th. The strike ended because the Cleveland-Cliffs Iron Company entered into an agreement with the United Steelworkers of America-CIO on November 12th terminating the strike in the iron ore mines operated by the Company in Michigan and Minnesota. The agreement provided for the payment of pensions on the same basis as had been included in other agreements in the steel and iron ore producing companies.

In conclusion during the strike period the Union instructed the hoisting engineers, pumpmen and heating plant employees only to report for work during the strike period. However, we are happy to state that the supervisory force at our properties did a fine maintenance job, permitting the mines to resume production promptly after the strike issues were settled.

SAFETY DEPARTMENT

The fatal accident record for the Company's properties showed much improvement over the previous year. You will please note from the tabulation which follows that the fatality rate, with the exception of the year 1946, stands at an all time low.

The number of man shifts worked and tons of ore produced per fatality for the last ten years is as follows:

NUMBER OF MAN SHIFTS WORKED AND TONS OF ORE PRODUCED
PER FATALITY

<u>Year</u>	<u>Number of Fatalities</u>	<u>Number of days worked per fatality</u>	<u>Number of tons of ore mined per fatality</u>
1940	5	142,878	1,156,387
1941	5	182,340	1,456,528
1942	2	512,356	3,808,258
1943	4	269,351	1,624,315
1944	3	331,090	1,995,787
1945	1	915,666	5,970,577
1946	0	747,079	4,416,253
1947	7	153,031	1,130,679
1948	3	386,965	2,869,090
1949	1	1,013,442	7,162,324

It will be noted that the number of tons of ore mined per fatality stands at the highest figure for the past ten years.

Another tabulation is put in this report because it will give one an opportunity to compare the frequency and severity ratings of our properties with the national rating for coal and metal mining and also gives you a basis of comparison with the other companies operating in the Lake Superior District:

COMPARISON OF FREQUENCY-SEVERITY RATINGS

	<u>Frequency</u>	<u>Severity</u>	
1948 National rating, all mining, including coal	43.96	7.14	
1948 " " coal mining	53.79	8.79	
1948 " " metal mining	52.72	9.14	
1948 Lake Superior District Mines, 24 companies	18.46	3.96	
1949 Lake Superior mines safety exchange, not Inc. C.C.I.	12.34	3.14	
1949 Lake Superior mines safety exchange, inc. C.C.I.	18.24	2.82	
1949 The Cleveland-Cliffs Iron Co. compensable accidents	15.66	1.39	
1949 " " all accidents	43.91	1.46	
1949 " " Open cut mining	21.86	.50	2.10*
1949 " " concentrating plants	42.25	.83	0.22*
1949 " " top slicing	87.29	1.20	4.23*
1949 " " sub level caving	47.09	3.40	8.18*
1949 " " stoping	46.01	.76	6.81*
1949 " " block caving	69.02	.97	
1949 " " shaft sinking, Dev.	42.44	.13	
1949 " " General Shops	9.12	.04	0.26*
1949 " " C.P. & L. Co.	6.91	.31	
1949 " " General roll	0.00	.00	
1949 " " Miscellaneous	0.00	.00	0.14*

* 1948 Lake Superior District Severity Ratings.

DETAILED STATEMENTS

Comparisons of valuations and taxes; explosives; mine timber; supply breakdown, etc., will be forwarded to Cleveland shortly.

Yours very truly

General Manager

CJS:P

AT BOND
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SIA
GILBERT
COTTON FIBRE
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THE CLEVELAND-CLIFFS IRON COMPANY
MINING DEPARTMENT
A COMPARISON OF MINING DEPARTMENT MICHIGAN ASSESSED VALUATION AND
TOTAL TAXES PAID FROM YEAR 1929 THROUGH 1949

YEAR	The C C I Co	The Negaunee Mine Co	The Athens Ir Mng Co	The C P & L Co	Total Four Companies	Changes from Pre- vious Year
<u>Assessed valuation</u>						
1929	\$ 13,291,521	5,284,600	2,586,500	1,318,198	22,480,819	I
1930	14,169,590	4,884,400	2,436,500	1,370,445	22,860,935	II 380,116
1931	13,867,696	4,635,700	2,536,500	1,539,428	22,579,324	II 218,389
1932	12,815,645	4,185,700	2,226,500	1,447,936	20,715,781	II 1,863,543
1933	9,850,359	3,554,400	2,036,500	1,419,565	16,860,824	II 3,654,957
1934	10,002,373	3,196,400	2,077,800	1,418,887	16,695,460	II 165,364
1935	10,062,288	3,057,770	1,929,520	1,424,711	16,474,289	II 221,171
1936	10,283,100	3,107,500	1,929,520	1,424,281	16,724,401	II 250,112
1937	11,589,306	3,350,000	2,242,900	1,442,555	18,624,761	II 1,900,360
1938	12,959,542	3,124,100	2,532,900	1,447,843	20,064,385	II 1,439,624
1939	13,090,541	3,267,300	2,683,400	1,981,982	21,023,223	II 958,838
1940	12,185,132	3,692,700	2,683,400	2,003,335	20,564,567	II 458,656
1941	11,202,237	4,644,430	2,683,400	2,004,379	20,534,446	II 30,121
1942	10,628,886	5,461,800	2,759,000	2,016,245	20,865,931	II 331,485
1943	11,936,427	5,418,800	2,785,300	2,134,715	22,275,242	II 1,409,311
1944	12,328,490	5,022,010	2,868,550	2,134,755	22,351,805	II 76,563
1945	11,949,265	4,809,060	2,446,740	2,135,750	21,340,815	II 1,010,990
1946	11,423,395	4,170,610	2,327,690	2,136,050	20,957,745	II 383,070
1947	11,826,910	4,524,225	2,197,815	2,148,105	20,697,055	II 260,690
1948	11,744,905	4,710,145	2,082,815	2,157,405	20,695,270	II 1,785
1949	11,884,480	5,608,650	2,048,715	3,385,014	22,926,859	II 2,231,589
<u>Taxes - paid</u>						
1929	\$ 476,740.79	199,695.33	97,739.13	55,233.01	829,398.26	
1930	522,901.50	190,689.79	95,122.50	51,352.11	870,064.90	I 40,666.64
1931	507,175.34	183,218.38	100,251.06	65,344.18	855,988.96	D 14,075.95
1932	377,700.32	120,527.71	65,264.22	46,897.77	610,390.02	D 245,598.94
1933	261,765.08	99,599.60	57,065.71	36,067.26	454,067.26	D 155,892.37
1934	267,327.80	86,527.53	56,246.84	31,256.06	441,358.23	D 13,139.42
1935	279,734.41	95,226.14	60,089.81	29,817.75	464,868.11	I 23,509.88
1936	302,207.99	107,861.43	66,447.06	30,066.37	505,782.85	I 40,914.74
1937	345,790.20	120,097.50	80,366.44	30,024.80	576,278.94	I 70,496.09
1938	415,719.34	118,534.83	96,103.47	30,227.17	660,584.81	I 84,305.87
1939	415,979.65	120,806.75	99,217.45	37,997.17	674,997.17	I 13,416.21
1940	376,744.89	130,696.88	95,075.43	39,698.46	642,215.65	D 31,785.39
1941	340,282.83	156,845.98	90,003.76	39,846.19	626,978.76	D 15,236.87
1942	321,091.31	182,845.08	91,057.97	37,686.66	632,681.02	I 5,702.26
1943	380,652.40	202,371.63	107,251.69	40,623.07	730,898.79	I 98,217.77
1944	436,214.77	200,703.60	121,015.20	40,577.13	797,510.70	I 67,611.91
1945	425,599.58	191,585.47	104,255.07	40,964.14	762,384.26	D 36,126.44
1946	417,575.92	168,599.05	103,799.44	43,785.56	733,739.97	D 28,644.29
1947	438,298.87	178,769.39	98,262.27	47,743.90	763,074.43	I 29,334.46
1948	470,710.79	194,238.19	93,223.59	52,220.35	810,392.92	I 47,318.49
1949	496,213.03	229,397.68	108,352.31	92,041.23	926,204.25	I 115,811.33

Notes: The 15-Mill Tax Amendment went into effect in 1933.
The Michigan State Sales Tax became effective in July 1933, practically replacing the State Ad Valorem Taxes.
The drop in C C I Co 1933 valuation is due to the Inland Steel Co. taking over the Morris Mine.
The State Tax Commission revalued Marquette County in 1949.

STATEMENT SHOWING COMPARATIVE COST FOR ALL EXPLOSIVES
USED AT HARD ORE MINES

	1946	1947	1948	1949
PRODUCT - Tons	401,939	546,796	602,453	492,405
POWDER				
Pounds - Gelamite 2X	360,550			
60% Gelamite			350	200
Gelamite #1	7,550	52,250	80,500	80,050
Hercomite 2X.....		449,650	520,600	391,300
Hercomite 2XA		47,600		
Total Pounds Powder	368,100	549,500	601,450	471,550
Total Cost	\$ 45,329.42	\$ 74,587.53	\$ 84,605.78	\$ 68,984.15
Fuse - Feet	561,500	814,864	838,775	742,670
Caps, Number	86,865	131,140	131,261	114,495
Duplex Shot Wire - Feet	11,115	---	---	---
Electric Caps	23,500	15,435	19,830	23,943
Fuse Lighters	11,900	42,500	56,320	42,500
Connecting Wire - Lbs.	347	768	727	747
Tamping Bags	8,300	10,200	11,224	4,870
Powder Bags			12	
No. 18 Shot Wire.....		13,081	13,628	6,755
Total Cost - Fuse, Caps, etc. \$	6,584.20	12,050.74	13,760.42	12,986.35
Total Cost - All Explosives \$	51,913.62	86,638.27	98,366.20	81,970.50
Average Price per Pound - Powder \$.1231	.1357	.1406	.1463
Cost per ton - Powder	\$.1127	\$.1364	\$.1404	\$.1401
Cost per ton - Fuse, etc.	\$.0164	\$.0220	\$.0228	\$.0264
Cost per ton - All Explosives...	\$.1291	\$.1584	\$.1632	\$.1665
Pounds of Powder per ton of Ore	.916	1.005	.998	.9576

The production decreased 110,048 tons, or 18.3% in 1949 compared with 1948. The average price per pound for powder increased \$.0057, or 4% over 1948, and \$.0106, or 7.8% over 1947. The cost per ton for all explosives increased \$.0033, or 2% over 1948, and \$.0081, or 5.1% over 1947.

STATEMENT SHOWING COMPARATIVE COST OF ALL EXPLOSIVES
USED AT SOFT ORE MINES

	1946	1947	1948	1949
PRODUCT - Tons	2,143,676	3,286,638	3,152,904	2,944,310
POWDER				
Pounds - 40%	100	7,897		
50%	---	---		
60%	33,125	13,325	51,758	125,272
80%		3,206	568	
1X and 2X Hercomite.....	896,138	1,195,381	1,144,255	783,041
1X and 2X Gelamite.....		137,100	199,990	315,521
Herculite.....			850	600
Total Pounds - Powder.....	929,363	1,356,909	1,397,421	1,224,434
Total Cost - Powder	\$113,896.57	\$184,282.70	\$199,294.38	\$186,034.08
Fuse - Feet	3,082,459	4,377,420	4,121,214	3,311,772
Caps - Number	421,489	550,703	528,234	432,647
Leading Wire - Feet	17,750	112,510	17,785	13,730
Connecting Wire - Pounds	62	96	128	70
Tamping Bags - Number	62,350	36,000	2,000	---
Tamptite Shells		38,950	34,420	11,280
Powder Bags	137	170	190	125
Fuse Lighters	96,900	124,300	112,350	97,500
Electric Exploders	9,381	15,291	18,306	9,017
Master Fuse Lighters	1,000		1,000	500
Primacord - Feet			277,286	616,900
Total Cost, Fuse, Caps, etc.	\$ 25,792.30	\$ 45,871.33	\$ 55,113.19	\$ 57,794.56
Total Cost, All Explosives.	\$139,688.87	\$230,154.03	\$254,407.57	\$243,828.64
Average Price per Pound - Powder	\$.1226	\$.1358	\$.1426	\$.1519
Cost per Ton - Powder	\$.0531	\$.0561	\$.0632	\$.0632
Cost per Ton - Fuse, Caps, etc..	\$.0121	\$.0139	\$.0175	\$.0196
Cost per Ton - All Explosives ..	\$.0652	\$.0700	\$.0807	\$.0828
Pounds of Powder per ton of Ore	.4335	.4128	.4432	.4159

The mines included in 1949 figures are the Athens, Cambria-Jackson, Lloyd, Maas, Mather "A", and Negaunee.

1949 Production decreased 208,594 tons, or 6.6% as compared with 1948, due to three causes:

1. Working schedule cut from 6 days to 5 days per week June 27th, and on Aug. 29th, Spies dropped to 4 days per week.
2. Negaunee Mine went out of production April 27th, 1949.
3. All Mines closed from October 1st to November 13th inclusive, due to strike.

Average price per pound for powder increased \$.0093, or 6.5% over 1948, and \$.0161, or 11.8% over 1947.

The cost per ton for all explosives increased \$.0021, or 2.6% over 1948, and \$.0128, or 18.3% over 1947.

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STATEMENT SHOWING TOTAL COST OF SUPPLIES CHARGED TO "COST OF ORE AT MINE"

SOFT ORE MINES

	1946		1947		1948		1949	
PRODUCT - Tons	2,143,676		3,286,638		3,152,904		2,944,310	
<u>CLASSIFICATION</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>
General Supplies	\$130,768.63	\$.061	\$263,751.82	\$.080	\$325,932.61	\$.103	\$286,302.00	\$.097
Iron & Steel	48,990.40	.023	93,845.90	.029	178,906.88	.057	218,120.00	.074
Machinery	111,045.43	.052	184,861.63	.056	290,254.37	.092	255,873.00	.087
Explosives	139,771.78	.065	237,793.22	.072	267,845.53	.085	277,192.00	.094
Lumber and Timber	300,772.30	.140	395,918.94	.120	457,298.10	.145	382,236.00	.130
Fuel	24,354.23	.011	36,880.91	.011	50,356.32	.016	52,668.00	.018
Electric Power	363,012.67	.169	570,798.56	.174	560,968.17	.178	521,703.00	.177
Miscellaneous	57,565.92	.028	72,979.68	.023	86,602.21	.027	60,250.00	.021
Total	\$1,176,281.36	.549	\$1,856,830.66	.565	\$2,218,164.19	.703	\$2,054,344.00	.698

HARD ORE MINES

	1946		1947		1948		1949	
PRODUCT - Tons	401,939		546,796		602,453		492,405	
<u>CLASSIFICATION</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>
General Supplies	36,551.28	.092	69,518.09	.127	79,821.82	.134	77,808.00	.158
Iron & Steel	25,785.43	.064	59,216.76	.108	71,372.95	.118	75,603.00	.154
Machinery	42,003.20	.104	74,426.64	.136	98,662.88	.164	72,885.00	.148
Explosives	51,913.62	.129	86,642.60	.158	98,366.20	.163	81,971.00	.166
Lumber and Timber	12,306.75	.031	29,023.34	.053	24,712.61	.041	21,462.00	.044
Fuel	3,205.94	.008	5,853.67	.012	7,524.44	.012	8,336.00	.017
Electric Power	74,927.89	.186	113,591.74	.208	117,605.65	.195	107,479.00	.218
Miscellaneous	5,154.82	.014	13,044.77	.024	18,009.45	.030	16,477.00	.033
Total	\$ 251,848.93	\$.628	\$ 451,317.61	\$.826	\$516,076.00	\$.857	\$ 462,021.00	\$.938

NOTE: 1949 Soft Ore Mines included in statement, - Athens, Maas, Negaunee, Lloyd, Mather "A", and Cambria-Jackson.

THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT
LABOR SUMMARY -- ALL COMPANIES

	<u>1946</u>		<u>1947</u>		<u>1948</u>		<u>1949</u>	
PRODUCTION - TONS	4,402,437		7,970,030		8,605,471		7,134,528	
	DAYS	AMOUNT	DAYS	AMOUNT	DAYS	AMOUNT	DAYS	AMOUNT
Surface	321,987	\$ 3,025,895.78	484,004	\$ 5,129,821.26	524,388	\$ 5,977,241.26	451,917 $\frac{1}{2}$	\$ 5,357,595.59
Cost per Ton		\$.687		\$.644		\$.695		\$.751
Underground	361,865 $\frac{1}{2}$	3,749,800.17	530,893 $\frac{1}{2}$	6,108,235.82	573,482 $\frac{1}{2}$	7,198,264.61	493,990	6,495,934.84
Cost per Ton852		.766		.836		.911
Superintendence & General Roll	55,709 $\frac{1}{2}$	596,572.89	58,401 $\frac{1}{2}$	795,466.17	63,604 $\frac{1}{2}$	925,453.99	67,265	1,001,379.19
Cost per Ton136		.100		.108		.140
GRAND TOTAL	739,562 $\frac{1}{2}$	\$ 7,372,268.84	1,073,299 $\frac{1}{2}$	\$12,033,523.25	1,161,474 $\frac{1}{2}$	\$14,100,959.86	1,013,172	\$12,854,909.62
COST PER TON		\$1.675		\$1.510		\$1.639		\$1.802
Average Rate per Day		\$9.97		\$11.21		\$12.14		\$12.69
Tons per Man per Day		6.41		7.43		7.19		7.04

NOTES: The above is the total of all wages and salaries for employees of the Mining Department, including the Cliffs Power & Light Company. The Mines were idle in 1946 from February 8th to May 22nd, and again in 1949 from October 1st to November 14th, due to Union Strike.

WAGES:

Wages were increased 9%, effective July 16th, 1948, based on a sliding scale from 9 $\frac{1}{2}$ ¢ to 16 $\frac{1}{2}$ ¢ per hour.

1949 WORKING SCHEDULE

MICHIGAN

Underground mines, excepting Lloyd, operated 2-8 hr. shifts 6 days per week to June 27th, when working schedule was cut to 5 days per week. Lloyd operated 3-8 hrs. per day. On August 29th Spies was cut to 4 days per week. On April 27th Negaunee Mine went out of production. Tilden Mine operated 1-8 hr. shift 5 days per week from June 20th to September 20th, 1949.

MINNESOTA

Agnew and Sargent, underground mines, worked 2-8 hr. shifts 6 days per week to June 27th, when schedule was cut to 5 days per week. Atkins commenced ore operations May 9th, ceased November 30th. Cenisteo commenced ore operations May 2nd, ceased September 30th. Hill-Trumbull " " " May 2nd, " September 30th. Holman-Cliffs " " " May 9th, " " 30th. Hawkins Mine " " " May 2nd, " " 30th. Open Pits all operated 2-8 hr. shifts, 5 days per week.

COMPARISON OF TOTAL DAYS WORKED AND TONS OF ORE MINED
FOR THE YEARS 1949 AND 1948

	1949 DAYS	1948 DAYS	1949 DAYS	1948 DAYS
GRAND TOTAL - ALL OPERATIONS	1,013,172 $\frac{1}{4}$	1,161,474 $\frac{3}{4}$		
<u>NON-OPERATING TIME:</u>				
General Shops & Storehouse	3,159 $\frac{1}{4}$	3,526		
Miscellaneous Payroll	19,427 $\frac{3}{4}$	18,581 $\frac{3}{4}$		
Michigan Non-operating	130,334 $\frac{3}{4}$	145,148 $\frac{1}{2}$		
The Cliffs Power & Light Company	21,033	20,770		
Minnesota Non-operating	8,479	92,527 $\frac{1}{4}$		
Total Non-operating	182,433 $\frac{1}{2}$	280,853 $\frac{1}{2}$		
<u>Net Operating Days</u>	830,738 $\frac{3}{4}$	880,621 $\frac{1}{2}$	830,738 $\frac{3}{4}$	880,621 $\frac{1}{2}$
Total Production - Tons	7,134,528	8,605,471		
Tons per Man per Day	8.59	9.77		
<u>OPEN PIT PRODUCTION</u>				
	<u>TONS</u>		<u>DAYS</u>	
Tilden Mine	88,503	140,692	3,583	4,644
Atkins Mine	441,398	483,705	7,532 $\frac{3}{4}$	9,231 $\frac{1}{2}$
Canisteo Mine	551,499	908,833	23,830	27,361 $\frac{1}{2}$
Hawkins Mine	604,928	660,037	23,357 $\frac{1}{4}$	25,720 $\frac{3}{4}$
Hill-Trumbull Mine	560,283	768,394	31,628	36,612 $\frac{3}{4}$
Holman-Cliffs	705,438	993,805	27,487	34,452 $\frac{3}{4}$
Total	2,952,049	3,955,466	117,418	138,022 $\frac{1}{2}$
Open Pit - Tons per Man per Day	25.14	28.66		
Net Days - Underground Mines			713,320 $\frac{3}{4}$	742,598 $\frac{3}{4}$
Net Tons - Underground Mines			4,182,479	4,650,005
Underground Mines - Tons per Man per Day ..			5.86	6.26
<u>PERCENTAGE OF TOTAL PRODUCTION</u>				
	<u>1949</u>		<u>1948</u>	
	<u>TONS</u>	<u>PER CENT</u>	<u>TONS</u>	<u>PER CENT</u>
Underground Mines	4,182,479	58.62	4,650,005	54.04
Open Pit Mines	2,952,049	41.38	3,955,466	45.96
Total	7,134,528		8,605,471	

THE CLEVELAND-CLIFFS IRON COMPANY
STATEMENT SHOWING PENALTY COST OF OVERTIME WORKED
AND EFFECT ON PRODUCTION COST FOR YEAR 1949

	MICHIGAN PROPERTIES	MINNESOTA PROPERTIES	TOTAL
<u>YEAR 1949</u>			
January	\$ 65,282.50	\$ 8,457.07	
February	57,105.03	6,027.10	
March	61,149.13	6,074.28	
April	68,017.73	11,812.28	
May	60,237.12	12,674.07	
June	55,961.13	14,704.69	
July	14,309.06	13,117.58	
August	11,237.97	9,348.48	
September	13,188.68	12,354.49	
October	2,406.38	477.84	
November	5,786.78	5,114.15	
December	11,875.91	4,116.97	
Total - Year 1949	\$ 426,557.42	\$ 104,279.00	\$ 530,836.42
Total - Year 1948	\$ 639,279.53	\$ 174,334.15	\$ 813,613.68
 <u>PRODUCTION</u>			
Tons - Year 1949	3,675,240	3,459,288	7,134,528
Tons - Year 1948	4,093,305	4,512,166	8,605,471
 <u>EFFECT THE PENALTY COST HAD ON YEAR'S PRODUCTION COST</u>			
Increased 1949 by	\$.1161	\$.0301	\$.0744
Increased 1948 by	\$.1562	\$.0386	\$.0945

Note: Decrease due to all underground mines reducing operations from 6 days per week to 5 days on June 27th, 1949, plus effect of idle period from October 1st to November 13th inclusive, due to strike.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

1. GENERAL:

Production from the Cliffs Shaft Mine totaled 492,405 tons in the year 1949. This was 5,749 tons below the revised estimate of production. Both shafts operated during the year for a total of 245 days. From January 1st to July 1st, the mine operated on a 6 day per week schedule. From July 1st to the end of the year the schedule was reduced to 5 days per week. The mine was closed from September 30th to November 14th by a strike called by the United Steelworkers of America (C I O) Union.

Cost of production increased from \$3.734 in 1948 to \$4.114 in 1949 and total cost from \$4.214 in 1948 to \$4.559 in 1949. The increased cost is a reflection of the drop in tons per man from 4.48 in 1948 to 4.40 in 1949. The year 1948 showed a decided improvement in efficiency over 1947. This was attributable primarily to two factors namely, - the improvement in the incentive pay system for miners and the introduction of the Carset drilling technique to approximately one-third of the contracts. In 1949 the new drilling technique was rapidly expanded so that more contracts could take advantage of the improvement. Some individual contracts did but the overall result was disappointing. Why? Two things happened that I believe help explain this condition. The Greenwood Mine laid off one complete shift of men in June 1949. The reason talked by the men was that they had too much broken ore in the stopes and that tungsten carbide drilling was responsible for this condition having made it so much easier to win product. In July the Cliffs Shaft Mine went from a six day schedule to a five day schedule. These two changes were taken by many of the men to be motivated by the same causative factors. Therefore it was politic not to be too efficient or one might work himself out of a job. Perhaps the reasoning was not so simple as outlined but we know that there was talk of that kind. The demand for lump ore from the Cliffs Shaft Mine in 1950, which has caused us to change back to a 6-day schedule and to add an extra mining shift, should dispel any fears that production will result in job loss.

In 1949 there was an average of 92.3 gangs working in the mine compared to 90.1 gangs in 1948. On an average, 35 of these were double crews employing two miners instead of one miner and one helper. This combination in most instances provides a much better working arrangement than the miner-helper combination. An average of 43 of the total of 92.3 crews used Carset bits in drilling in 1949. Of the total contracts, 11.8 gangs or 12.8% were engaged in drifting or raising during the year. Including the drifting and raising contracts, 46.3 or 50.2% of the gangs did development work as contrasted to the depleting mining of floors, pillars and back.

Lump ore shipments from stockpile were continued until November 28, 1949. The season was extended as long as possible because the strike interrupted shipments for six weeks in October and early November. Shipments from pocket and stockpile totalled 510,090 tons. The current year overrun from stockpile amounted to 4,916 tons and the pocket overrun was 5,634 tons for a total of 10,550 tons. This represents an overrun of 2.19% of the year's production. The skip weight factor remained unchanged through 1949 at 5.10 tons per skip.

The product was screened at the mine to separate the material minus 2 inches from the larger lump. This divided the product into 71.36% lump ore and 28.64% crushed ore.

During vacation week in August the rotor of "B" Shaft hoist motor was rewound with a new style of coil designed to eliminate some of the trouble we have had with leads and loose band wires.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

1. GENERAL: (Cont'd)

Improvements to the surface plant during 1949 consisted of the rebuilding of the lump ore railroad pocket with steel supports; erection of a rock disposal trestle that allows us to hoist rock from underground and dispose of it on surface; purchase of a second-hand Dumptor truck to replace the tractor-hauled Athey wagon used in disposing of rock picked from the ore at the picking belt; construction of a vibration proof base for the I.R.-54 drill sharpener in the Drill Shop; installation of bearer sets to carry the steel sets that are to be installed in the upper portion of "A" Shaft; and repair by Intrusion Prepaht of the concrete headframe over "B" Shaft. A start was made on replacement of the whole roof on the old boiler house and repairs to the roof of the Engine House.

For the underground operations we purchased in 1949: 1 - HC-10 Le Roi Reverse Feed Stoper; 16 - H-111 - LeRoi sinkers; 5 - CP-59 Chicago Pneumatic sinkers; and 27 - J-50 Ingersoll-Rand jackhammers for a total of 49 drill machines. We also purchased 3 - J-50 - 48" feed shells for use on a Cleveland Jumbo Rig. For most of the sinkers we bought 56 - Jackleg mountings.

The microseismic listening station was maintained through the year on the 13th level where we mined 9,333 tons from pillars and floor during 1949.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

2. PRODUCTION,
SHIPMENTS, &
INVENTORIES:

a. Production by Grades:

<u>Grade</u>	<u>Tons</u>	<u>% of Total</u>
Cliffs Shaft Lump	294,026	
Cliffs Shaft Crushed	<u>116,338</u>	
Total	410,364	83.34
Bancroft Lump	23,566	
Bancroft Crushed	<u>10,375</u>	
Total	33,941	6.89
Section 10 Lump	33,726	
Section 10 Crushed	<u>14,374</u>	
Total	<u>48,100</u>	<u>9.77</u>
GRAND TOTAL FEE & LEASE ORE	<u>492,405</u>	<u>100.00</u>

Production by grades and percentages of Lumps and Fines for the past ten years follows:

<u>Year</u>	<u>Lump Ore</u>		<u>Crushed Ore</u>		<u>Run-of-Mine Ore - Tons</u>	<u>Total Tons</u>
	<u>Tons</u>	<u>%</u>	<u>Tons</u>	<u>%</u>		
1940	371,745	67.68	177,469	32.32	<u>3,384</u>	552,598
1941	464,802	74.14	162,132	25.86	31,813	658,747
1942	225,759	79.98	56,510	20.02	431,261	713,530
1943	200,616	79.82	50,732	20.18	383,280	634,628
1944	443,123	76.29	137,701	23.71	6,227	587,051
1945	430,193	78.19	119,976	21.81		550,169
1946	294,264	73.21	107,675	26.79		401,939
1947	396,561	72.50	150,235	27.50		546,796
1948	427,903	71.00	174,550	29.00		602,453
1949	351,318	71.36	141,087	28.64		492,405

The revolving trommel was equipped during 1949 as follows:

Jan. 1st to Aug. 1949	-	(Bottom section - 2" Screen
		(Center " - 2½" Screen
		(Top " - 1" Screen
Aug. 1949 to Dec. 31st	-	(Bottom section - 2" Screen
		(Center " - 2" Screen
		(Top " - 1½" Screen

From January 1st, 1949 to November 15th, 1949 we used a ratio of separation of product - 29% Crushed, 71% Lump. From November 15th to the end of the year the ratio used was 27% Crushed, 73% Lump.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

2. PRODUCTION, ETC.:

All of the ore produced to date from the Bancroft Lease and Section 10 Lease since they were acquired by the Company is shown by years in the following table:

	Bancroft Ore Tons	Section 10 Ore Tons
From the Years 1925 to 1940	723,163	
1941	103,222	
1942	83,869	
1943	69,943	1,679
1944	64,742	15,789
1945	64,664	21,608
1946	47,998	17,338
1947	45,030	36,611
1948	53,919	41,920
1949	33,941	48,100
Total	1,290,491	183,045

b. Shipments:

<u>Grade</u>	<u>Pocket Tons</u>	<u>Stockpile Tons</u>	<u>Total Tons</u>	<u>Total Last Year</u>
Cliffs Shaft Lump	161,797	143,532	305,329	358,202
Cliffs Shaft Crushed	77,261	42,951	120,212	143,014
Bancroft Lump	15,824	8,728	24,552	38,168
Bancroft Crushed	7,138	3,939	11,077	16,393
Section 10 Lump	23,253	11,212	34,465	29,431
Section 10 Crushed	9,759	4,696	14,455	12,680
Total 1949	295,032	215,058	510,090	597,888
Total 1948	402,965	194,923	597,888	
Increase		20,135		
Decrease	107,933		87,798	

c. Stockpile Balances:

Ore in stock as of December 31, 1949:

Cliffs Shaft Lump	24,924
Cliffs Shaft Crushed	12,609
Bancroft Lump	468
Bancroft Crushed	468
Section 10 Lump	1,106
Section 10 Crushed	1,327
Total	40,902

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

2. PRODUCTION, ETC.: (Cont'd)

d. Division of Product by Levels:

<u>Level</u>	<u>"A" Shaft</u> <u>Tons</u>	<u>"B" Shaft</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>
1st	13,697	23,162	36,859
2nd	6,461	14,392	20,853
3rd	-	-	-
4th	34,737	20,721	55,458
5th	40,263	18,209	58,472
6th	18,961	22,303	41,264
7th	48,340	11,946	60,286
8th	31,691	5,952	37,643
9th	45,881	9,481	55,362
10th	26,495	11,582	38,077
11th	55,896	-	55,896
12th	6,455	-	6,455
13th	-	-	-
14th	-	20,025	20,025
15th	-	5,755	5,755
Total	328,877	163,528	492,405
Rock			19,122
Total Ore & Rock			511,527

e. Division of Product between Shafts:

The ten year table below shows where the ore has been broken and the percentage from each shaft:

<u>Year</u>	<u>"A" Shaft</u>		<u>"B" Shaft</u>		<u>Total</u>
	<u>Tons</u>	<u>%</u>	<u>Tons</u>	<u>%</u>	
1940	372,428	67.4	180,170	32.6	552,598
1941	408,342	62.0	250,405	38.0	658,747
1942	445,460	62.4	268,070	37.6	713,530
1943	391,455	61.6	243,173	38.4	634,628
1944	382,934	65.2	204,117	34.8	587,051
1945	374,864	68.1	175,305	31.9	550,169
1946	240,945	59.9	160,994	40.1	401,939
1947	337,019	61.6	209,777	38.4	546,796
1948	394,151	65.4	208,302	34.6	602,453
1949	328,877	66.8	163,528	33.2	492,405

The ratio of production between "A" and "B" Shafts shows a continued increase for "A" Shaft production. This is to be expected with the increase in development of the Section 10 Lease.

The table below shows how the product was hoisted through the twelve months of 1949. The split is remarkably even. This is possible because ore can be transferred on both the 10th and 15th levels.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

2. PRODUCTION, ETC.: (Cont'd)

Month	1949 Product as Hoisted		
	"A" Shaft Tons	"B" Shaft Tons	Total Tons
January	25,065	25,227	50,292
February	23,104	24,179	47,283
March	26,845	26,242	53,087
April	25,695	27,232	52,927
May	27,531	26,473	54,004
June	25,566	26,399	51,965
July	17,807	18,137	35,944
August	18,254	16,446	34,700
September	20,652	20,723	41,375
October	-	-	-
November	8,637	11,054	19,691
December	20,076	20,511	40,587
Total without Overrun	239,232	242,623	481,855
Pocket Overrun	2,761	2,873	5,634
Stockpile "	2,416	2,500	4,916
Grand Total Tons	244,409	247,996	492,405
% of Total	49.6	50.4	100.0

f. Production by Months:

Month	Optg. Days	CLIFFS SHAFT		BANCROFT		SECTION 10		Total
		Lump	Crushed	Lump	Crushed	Lump	Crushed	
Jan.	25	29,537	12,012	2,616	1,051	3,555	1,437	50,208
Feb.	24	28,352	11,535	2,547	1,044	2,581	1,035	47,094
March	27	31,185	13,861	3,739	1,805	2,697	1,293	54,580
April	26	30,970	12,311	4,364	1,868	3,532	1,499	54,544
May	25	33,948	12,375	2,752	1,041	3,432	1,361	54,909
June	26	30,377	11,361	2,518	1,013	4,755	1,937	51,961
July	20	21,732	8,638	1,713	719	2,739	1,162	36,703
Aug.	18	23,072	7,696	656	270	2,526	1,011	35,231
Sept.	21	26,228	9,168	873	329	3,434	1,321	41,353
Oct.	0	110	63	6	2	21	10	158
Nov.	12	12,545	4,477	739	240	1,738	576	20,315
Dec.	21	25,970	9,548	956	351	2,642	966	40,433
Current Years								
Stkpl. Overrun			3,293	99	642	116	766	4,916
Total	245	294,026	116,338	23,566	10,375	33,726	14,374	492,405

g. Ore Statement:

Grade	On Hand	Output	Total	Shipments	Balance On Hand
	Jan. 1, 1949	for Year			
C. S. Lump	36,227	294,026	330,253	305,329	24,924
C. S. Crushed	16,484	116,338	132,822	120,213	12,609
Banc. Lump	1,454	23,566	25,020	24,552	468
Banc. Crushed	1,170	10,375	11,545	11,077	468
Sec. 10 Lump	1,845	33,726	35,571	34,465	1,106
Sec. 10 Crushed	1,408	14,374	15,782	14,455	1,327
Total 1949	58,588	492,405	550,993	510,091	40,902
Total 1948	54,023	602,453	656,476	597,888	58,588

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

2. PRODUCTION, ETC.: (Cont'd)

Date	Time Lost	Tons Lost	Remarks
Jan. 10	3 $\frac{1}{4}$ hrs.	200	Trouble with "B" Shaft hoist
28	4 $\frac{1}{2}$ "	500	Motor bearing on Crushed ore top tram burned out
Feb. 8	1 $\frac{1}{4}$ "	100	Mud in "B" Shaft skip pit
16	2 "	300	Runner broke-"B" Shaft and "B" Shaft top tram car damaged
17	3 "	100	Repairing broken runner in "B" Shaft
Mar. 9	2 $\frac{1}{2}$ "	200	Repairing Crusher & marking "B" Shaft rope
Apr. 25	1 $\frac{1}{2}$ "	-	Skip went through gate-10th level "A" Shaft
26	1 "	100	Repairing crusher
May 2	1 $\frac{1}{4}$ "	150	Repairing dust collar on Crusher
4	3 $\frac{1}{4}$ "	100	No power
5	3 $\frac{1}{4}$ "	100	No power
5	1 $\frac{3}{4}$ "	100	Chunks in crusher
6	5 $\frac{3}{4}$ "	700	Power line to Crusher out of commission
18	3 $\frac{1}{4}$ "	100	Chunks in "A" Shaft
25	1 "	100	Repairing floor of "B" Shaft cage
31	1 "	100	Large chunks in Crusher
June 12	1 "	100	Repairing "A" Shaft skip
20	1 $\frac{3}{4}$ "	200	Skip went through gate in "B" Shaft
24	2 "	200	Repairing top tram air lift at Crusher
July 7	3 "	300	Brake on high top tram broken
12	1 $\frac{1}{2}$ "	100	Air lift in Crusher broken
20	3 $\frac{3}{4}$ "	300	Air lift at loading pocket broken
25	3 $\frac{1}{4}$ "	100	Broken gate in "A" Shaft
28	3 "	300	Electrical storm - no power
Aug. 1	2 "	200	Crusher repairs
Sept. 2	3 $\frac{3}{4}$ "	400	Pulled out runner 5th level and skip went through 8th level gate
6	3 "	100	Broken track - 10th level - "A" Shaft
8	1 $\frac{1}{2}$ "	100	Crusher repairs
Dec. 13	3 $\frac{1}{4}$ "	50	Frozen air valve in "A" Shaft
20	3 "	400	Repairs to pocket lip-8th Level, "A" Shaft and repairing "B" Shaft rock car
Total 1949		5800	
Total 1948		9400	

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

3. ANALYSIS:

a. Average Analysis of 1949 Output:

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Cliffs Shaft Lump	60.17	.099	9.19
Cliffs Shaft Crushed	51.39	.103	20.60
Bancroft Lump	60.78	.106	8.69
Bancroft Crushed	51.16	.107	19.67
Section 10 Lump	59.94	.107	9.03
Section 10 Crushed	51.73	.110	18.86

The iron content of the ore did not change appreciably in 1949 as compared to 1948 but silica increased slightly except for the Section 10 Lease ore. As the Lease production increases the output analysis should remain fairly stable.

b. Complete Analysis of 1949 Ores as Shipped From Mine:

<u>Grade</u>		<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Lump Ore	(x)	60.30	.098	9.20	.25	1.90	.63	.68	.011	.28
Crushed Ore	(x)	50.50	.095	21.27	.33	2.40	.75	.80	.014	1.19

(x) Cliffs Shaft, Bancroft and Section 10 ore combined

c. Analysis of Ore in stock Dec. 31, 1949:

		<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
C. S. Lump	Dried	61.91	.108	7.19	.25	1.89	.63	.68	.011	.80	-
C. S. Lump	Natural	61.74	.108	7.17	.25	1.89	.63	.68	.011	.80	.28
C. S. Crushed	Dried	49.99	.119	22.05	.33	2.40	.75	.79	.012	1.19	-
C. S. Crushed	Natural	49.01	.117	21.62	.32	2.35	.74	.78	.012	1.17	2.00
Ban. & Sec. 10	Dried	59.32	.116	10.06	.25	1.89	.63	.68	.010	.80	-
Lump	Natural	59.16	.116	10.03	.25	1.89	.63	.68	.010	.80	.28
Ban. & Sec. 10	Dried	51.78	.109	19.53	.33	2.40	.75	.79	.012	1.19	-
Crushed	Natural	50.77	.107	19.15	.32	2.35	.74	.78	.012	1.17	2.00

d. Analysis of Ore Reserves: (Run-of-Mine Ore)

	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Dried	58.30	.098	11.92	.25	2.08	.79	.76	.011	.983	-
Natural	57.90	.097	11.84	.25	2.07	.79	.76	.011	.977	.69

The above analysis is for the Cliffs Shaft, Bancroft and Section 10 ore.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

4. ESTIMATE
OF ORE
RESERVES:

Assumption: Factor used is 8, 9 and 10 cu. ft. per ton of ore in place.
The factor 9 is most commonly used.
10% deduction for rock and loss in mining.

Ore in Sight December 31, 1949:

Bancroft Area - "A" Shaft

Summary:

Bancroft Ore Available October 1, 1949	317,398
Less Production October 1, 1949 to Dec. 31, 1949	2,282
Gross Tonnage as of December 31, 1949	<u>315,116</u>
Less 10% for Mining and Rock	<u>31,740</u>
Net Total Bancroft Ore Available	283,376

Section 10 Lease

Summary:

Section 10 Ore Available October 1, 1949	439,545
Less Production Oct. 1, 1949 to Dec. 31, 1949	<u>5,911</u>
Gross Tonnage as of December 31, 1949	433,634
Less 10% for Mining and Rock	<u>43,955</u>
Net Total Section 10 Ore Available	389,679

Net Total Bancroft & Section 10 Lease	673,055
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Cliffs Shaft Fee Ore Areas

Summary:

Cliffs Shaft Ore Available Oct. 1, 1949 - "A" Shaft	954,360
" " " " Oct. 1, 1949 - "B" Shaft	373,944
" " " " Oct. 1, 1949 - Sec. 9 Expl.	<u>29,700</u>
Total Ore Available - Oct. 1, 1949 -	1,358,004
Less Production Oct. 1, 1949 to Dec. 31, 1949	<u>52,713</u>
Gross Tonnage as of Dec. 31, 1949	1,305,291
Less 10% for Mining and Rock	<u>135,800</u>
Net Total Fee Ore Available	1,169,491

Recapitulation:

Net Cliffs Shaft Ore Available	1,169,491
Net Bancroft Ore Available	283,376
Net Section 10 Lease Ore Available	<u>389,679</u>
Grand Total	1,842,546

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

4. ESTIMATE
OF ORE
RESERVES: (Cont'd)

Ore Reserves for the past two years are shown for comparison:

	<u>Dec. 31, 1949</u>	<u>Dec. 31, 1948</u>
Cliffs Shaft Ore Available	1,169,491 tons	1,162,651 tons
Banc. & Sec. 10 Ore Available	673,055 "	636,239 "
Total	<u>1,842,546 tons</u>	<u>1,798,890 tons</u>
Increase in 1949	43,656 "	

New Ore Developed in 1949 - 492,405 plus 43,656 equals 536,061 tons

The following table shows the variations in ore reserves in "A" and "B" Shafts since 1932:

Year	<u>Net Available Ore in Sight</u>			
	<u>Sec. 10 Ore</u>	<u>Bancroft Ore</u>	<u>Cliffs Shaft Ore</u>	
			<u>"A" Shaft</u>	<u>"B" Shaft</u>
	Tons	Tons	Tons	Tons
1932		210,864	1,055,384	245,483
1933		198,916	995,211	227,565
1934		204,730	1,091,100	251,087
1935		210,429	1,090,540	232,345
1936		246,659	1,055,621	289,828
1937		252,050	1,099,090	303,762
1938		243,512	1,105,663	307,991
1939		246,726	1,139,349	283,644
1940		231,402	1,105,158	288,482
1941		232,298	1,047,360	288,650
1942		257,758	977,345	278,567
1943	17,043	267,301	898,787	297,362
1944	107,904	272,351	834,801	305,530
1945	191,458	287,382	879,956	326,764
1946	254,811	267,779	851,107	330,855
1947	401,249	254,305	834,584	299,888
1948	364,941	271,298	827,519	335,132
1949	389,679	283,376	821,051	348,440

The total increase in reserves of 43,656 tons was made up primarily of gains in Lease ore reserves. This could be expected as development of the Section 10 area progressed. Ore available from "A" Shaft fee reserves dropped slightly but this was more than offset by the modest increase in "B" Shaft fee ore reserves. The exploratory drilling and development on the sub-levels above 1st level are responsible for the bulk of this increase. Short hole exploration has certainly proven its worth in 1949 in the Cliffs Shaft Mine.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

4. ESTIMATE
OF ORE
RESERVES: (Cont'd)

The table below shows that 1949 reserves are the highest since 1921. As mentioned above, the increase is due to the development of Section 10 Lease reserves and the development through exploration of "B" Shaft sub-level reserves. Even the Bancroft reserves increased by 12,078 tons which is a temporary reversal in a general downward trend for that area.

The sharp rise in reserves between 1945 and 1946 is primarily due to the elimination of one 10% deduction in the method of figuring the estimate. Prior to 1946 two 10% deductions were made.

Total Ore Available in Mine at the End of Each Year:

1949	1,842,546 Tons
1948	1,798,890 "
1947	1,816,756 "
1946	1,704,552 "
1945	1,685,560 "
1944	1,520,586 "
1943	1,480,493 "
1942	1,513,670 "
1941	1,568,308 "
1940	1,625,042 "
1939	1,669,719 "
1938	1,657,166 "
1937	1,654,902 "
1936	1,592,108 "
1935	1,533,314 "
1934	1,546,917 "
1933	1,421,692 "
1932	1,511,731 "
1931	1,541,050 "
1930	1,506,700 "
1929	1,388,216 "
1928	1,358,000 "
1927	1,392,000 "
1926	1,436,000 "
1925	1,444,000 "
1924	1,453,000 "
1923	1,361,000 "
1922	1,364,000 "
1921	1,386,000 "

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

5. LABOR AND
WAGES:

a. General:

Twelve more men were employed in the underground crew and five more in the surface crew in 1949 as compared to 1948.

The number of double crews did not change much during 1949. By the end of the year, 39 of the 93 contracts were double gangs employing two miners instead of one miner and a miner's helper. This is an increase in two-miner contracts of six, from the latter part of 1948. The men selected for mining in 1949 have been men who were employed in 1947. They have had barely two years experience. This means that we must of necessity go somewhat slow in promoting men to miners in order to be able to select those who are able to perform that function with such limited experience.

b. Comparative Statement of Wages and Product:

	<u>1949</u>	<u>1948</u>
PRODUCT:	492,405	602,453
No. of Shifts & Hours	2-8 hr.	2-8 hr.
No. of Days Operated	245	307
<u>Average Number of Men Employed</u>		
Surface	100	95
Underground	<u>344</u>	<u>332</u>
Total	444	427
<u>Average Wages Per Day</u>		
Surface	11.06	10.78
Underground	<u>12.36</u>	<u>11.82</u>
Total	12.06	11.59
<u>Product Per Man Per Day</u>		
Surface	18.02	18.76
Underground	<u>5.82</u>	<u>5.88</u>
Total	4.40	4.48
<u>Labor Cost Per Ton</u>		
Surface	.629	.585
Underground	<u>2.126</u>	<u>2.010</u>
Total	2.755	2.595

The decrease in product per man per day was not great but this, coupled with the higher average wages, is responsible for the increase in cost per ton. The disappointing factor is that miner efficiency did not increase as expected from the extension of the better drilling technique. Perhaps the percentage of relatively inexperienced miners was the off-setting factor.

Penalty earnings decreased by 46% as could be expected from the changed schedule to a five-day from a six-day operation on July 1, 1949.

1949	\$ 59,009.87
1948	<u>110,552.09</u>
Decrease	\$ 51,542.22

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

5. LABOR AND WAGES: (Cont'd)

Surface and underground labor costs per ton for the past ten years are as follows:

<u>Year</u>	<u>Surface Labor</u>	<u>Underground Labor</u>	<u>Total Labor</u>
1949	.629	2.126	2.755 (x)
1948	.585	2.010	2.595
1947	.615	1.958	2.573
1946	.518	1.670	2.188 (°)
1945	.442	1.353	1.795
1944	.405	1.404	1.809
1943	.396	1.399	1.795
1942	.301	1.170	1.471
1941	.297	1.173	1.470
1940	.241	.936	1.177

(x) Costs for 10½ operating months.

(°) Costs for 8½ operating months.

	<u>Shifts</u>	<u>Earnings</u>	<u>Avg. Wages 1949</u>	<u>Avg. Wages 1948</u>
Contract Miners				
Dev. in Rock	1,732	23,372.28	13.49	12.91
Dev. in Ore	1,747	22,588.39	12.93	12.54
Stopping	<u>26,741</u>	<u>346,375.44</u>	<u>12.95</u>	<u>12.11</u>
Total Contract Miners	30,220	392,335.11	12.98	12.18
Contract Trammers	<u>340</u>	<u>5,905.96</u>	<u>17.37</u>	<u>16.80</u>
Total Contract Labor	30,560	398,241.07	13.03	12.26

The comparison of miners contract earnings include a full year in 1949 under the revised incentive pay system. In 1948 the revised system was put into effect in the last half of May.

Total Number of Days

	<u>1949</u>	<u>1948</u>
Surface	27,316	32,348
Underground	<u>84,553</u>	<u>102,254</u>
Total	111,869	134,602

Amount for Labor

	<u>1949</u>	<u>1948</u>
Surface	309,718.50	352,729.69
Underground	<u>1,047,128.83</u>	<u>1,210,995.20</u>
Total	1,356,847.33	1,563,724.89

Proportion of Surface to Underground Men

1949	1 to 3.09
1948	1 to 3.33
1947	1 to 3.40
1946	1 to 3.54
1945	1 to 2.74
1944	1 to 3.20
1943	1 to 3.19
1942	1 to 3.36
1941	1 to 3.32
1940	1 to 3.43

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

6. SURFACE:

a. Buildings and Repairs:

The table below shows cost of repairs to mine buildings for the years 1945 - 1949:

	<u>1949</u>	<u>1948</u>	<u>1947</u>	<u>1946</u>	<u>1945</u>
Office & Warehouse	426.05	1037.22	394.80	67.57	537.42
Shops	4036.17	7702.74	1224.02	1726.31	1679.64
Shaft House	26403.77	1115.74	1463.91	1380.98	567.28
Engine House	717.64	1476.00	5624.90	1717.91	1052.36
Dry House	1587.80	2876.71	1353.76	1352.63	1569.07
Coal Dock & Trestle	1508.49	765.97	1754.31	279.96	419.37
Crusher Building	820.73	899.74	200.84	145.77	878.57
Miscellaneous	<u>753.74</u>	<u>1548.47</u>	<u>1416.61</u>	<u>342.65</u>	<u>967.27</u>
Total	36254.39	17422.59	13434.15	7013.78	7670.98

Total cost increased \$18,831.80 in 1949 as compared to 1948.

With the exception of two categories, the shafthouse and coal dock and trestle costs, all of the accounts were appreciably lower in 1949 than 1948. In the past few years the concrete headframes have been showing deterioration of the concrete at a rapidly accelerated rate. This had gone so far that the walls in some places were almost penetrated by scaling from both the inside and out. To restore the headframes' structural strength we engaged Intrusion-Prepakt Company. They cut out all the rotten concrete and by their process put in new concrete. They started the job on "B" Shafthouse in late July and finished in early October. This work cost \$21,141.34. The remainder of the shafthouse expense was routine repairs plus some work in preparation for steel stairways to replace the rotted wood stairs. The coal dock needed extensive repairs in 1949 and this work increased the expense to approximately double that of 1948.

Expenditures for repair of "A" Shaft headframe, similar to the repair of "B" Shafthouse, have been forecast for 1950. This work must be done.

7. UNDERGROUND:

a. Development:

1. Section 10 Lease:

The Section 10 Lease produced 48,100 tons of ore in 1949 or 9.77% of the total production compared to 41,920 tons or 6.95% of the total in 1948. The number of gangs working in the Section 10 Lease averaged about the same as last year - 8.5. Productivity increased because more of the places had become fully developed stoping areas by 1949.

The known ore occurrences of the Section 10 Lease have been previously divided into three groups for purpose of discussion. They are No. 1: the syncline between the 1st and 3rd levels in the area immediately south of the north boundary of the Section 10 Lease between coordinates 0 and 600 E. No. 2: the anticline between 1600 E and 3000 E lying adjacent to the Cliffs Shaft fee property along its south boundary. No. 3: the main syncline which is the westward extension of the Moro Mine structure. In the No. 1 area, Contract No. 1 was the only gang that did any work in 1949.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

1. Section 10 Lease: (Cont'd)

They drifted 30' east on the 1145' sub-level to reach coordinates 1280 S - 330 E. The ore vein, which is only 8' wide at this point, strikes east-west and dips about 45° to the south. Contract No. 1 mined some floor on the 1145' sub-level and back from the 1st level at coordinates 1280 S - 300 E. We know that this ore vein extends down to the 3rd level elevation at least. Two raises were started in 1949 to connect the 5th level drift with the floor of the 1st level in this Southwest ore vein. One of these will hole to the floor in the Section 10 Lease portion of the ore vein. This raise will be completed by Contract 64 in the first quarter of 1950.

In the No. 2 area on the 4th level elevation, Contract No. 2 breast stoped 35' southeast toward the hanging wall contact which was encountered at 1440 S - 2325 E. The crew then started a cross cut east, which was advanced 15' to 1400 S - 2340 E. They also completed a cross cut at coordinates 1330 S - 2260 E. This junction with their main development stope produced a pillar located according to a prescribed plan. The ore vein is approximately 150' wide on the Section 10 Lease. It strikes nearly east-west and dips from horizontal at the north boundary of the Lease to 40° south at the south contact with the slate hanging wall. The ore vein here is at the top of an anticline that strikes east-west. The portion of it that lies in the Section 10 Lease is south of the anticlinal axis.

Ten different gangs worked in the No. 3 area of the Section 10 Lease in 1949. Six of these worked on the 5th level. At the extreme west end of the development on the 5th level, Contract No. 96 holed a raise to the floor of the drift at its west end, the coordinates being 1370 S - 1320 E. This raise was put up from the 8th level in order to facilitate the development of the 5th level. We expect to continue drifting west in the ore vein which at this point is not more than 10' wide between the slate hanging wall on the south and dike footwall on the north. East of this development, Contract No. 74 worked in two places. Between coordinates 1480 E - and 1600 E, they stripped ore from both sides of the drift to produce a stope 30' wide. In the second place, they stoped north from the east-west drift to reach coordinates 1320 S - 1720 E. From the map it may be seen that the ore vein increases rapidly in width from 10' at the breast of the drift to approximately 90' where Contract No. 74 stoped north to the footwall 400' east of the drift breast. Still farther to the east, Contract No. 25, a double crew, extended two raise stopes north on the footwall and developed two small cross cuts to the east from each raise stope. The approximate center of this activity is 1360 S - 1980 E. Two-hundred feet east of Contract No. 25 another crew, No. 21, extended their raise stope north on the footwall to coordinates 1320 S - 2200 E. They also developed two cross cuts, one to the west and one to the east from their main north-south stope. All of this work follows an engineered pattern of pillars and stopes. The remaining two gangs that worked on the 5th level in the Section 10 Lease were No. 4 and No. 26. The former completed a raise from the 8th level to the 5th level at 1530 S - 2370 E and drifted 275' east and 75' south to connect to a raise put up from the 8th level at 1630 S - 2645 E. The other gang, No. 26, completed a raise from the 8th level to the 5th level at 1665 S - 2735 E. This development is on Cliffs Shaft fee property about 70' east of the east boundary of the Section 10 Lease.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

1. Section 10 Lease: (Cont'd)

While the ore vein is narrow on the west end it appears from old diamond drill hole No. 392 that it is about 140' wide at the east boundary of the Lease. Some dikes and lean ore streaks occur in this width but in general most of the material will be mineable.

On the 7th level, Contract No. 80 mined floor at 1525 S - 2170 E and developed a second north-south stope 37' wide and 80' long with the breast located at coordinates 1480 S - 2290 E. The ore vein has the same attitude here as on the 5th level with hanging wall slate in contact with the ore on the south and footwall dike on the north.

On the 8th level, Contract No. 96 extended the west drift 100' west to 1425 S - 1190 E and put up a raise to the drift on the 5th level as mentioned under the discussion of that level. There is some possibility that additional ore may be found still farther west, but present indications are that the vein will narrow to less than drift width thereby halting exploration by drifting. At the coordinates 1550 S - 2175 E, an operating raise was put up to the floor of No. 80 stope in order to facilitate removal of the floor from that stope. In the most southerly developed vein of ore on the 8th level, Contract No. 40 sliced ore from the west side of the drift and developed three cross cut breast stopes. One of these is 60' long and was driven to the west to coordinates 1850 S - 2320 E. The other two were advanced east to coordinates 1875 S - 2425 E and 1935 S - 2420 E. In the latter part of 1949, Contract No. 41 started drifting southeast toward the 10th level of the Moro Mine. By the end of the year this drift was advanced to 1725 S - 2425 E and had 285' to go before holing to the old Moro Mine workings. Sometime in 1950 we expect to open "J" Shaft of the Moro Mine in order to provide ventilation for the Section 10 Lease workings and the Moro Mine workings.

One gang worked on the 10th level Section 10 Lease during 1949. Contract No. 9 put up an operating raise to the floor of No. 40 stope on the 8th level. On April 16th a diamond drill crew started hole No. 610 from the concreted face of the drift at coordinates 1960 S - 2400 E. This special 4" drainage hole was completed after one interruption, on the 21st of July, when the 12th level Moro Mine workings were entered. Approximately 50 lbs. of water pressure was recorded indicating that the head of water in the Moro Mine was approximately 100'. In a few weeks this water was drained to the elevation of the Cliffs Shaft 10th level. It seems apparent that the flow of 230 gallons per minute from the fissure encountered on the 8th level in September 1944 has been draining the Moro Mine down to the elevation of the Cliffs Shaft 8th level. Therefore, when we completed the drainage hole from the 10th level the only remaining water in the Moro was below the elevation of the 8th level, Cliffs Shaft.

Two veins of mineable ore were encountered by the drainage hole. The first run is from 37' to 62' and the second is from 202' to 275' where the hole entered the Moro workings.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. "B" Shaft Pillar Area:

The microseismic recording apparatus was kept in use throughout 1949 on the 13th level in the "B" Shaft territory bounded by coordinates 0 to 200 S and 1400 to 1600 W. One pillar was removed in its entirety in this area and others will be reduced appreciably in size. Much ore was mined from the floor in this area. Total production for the year was 9,333 tons. So far, no evidence has developed that there are any serious stresses being developed in the roof arch over this area. At least no strain has resulted to bring down any rock from the arch.

A new area is being prepared for pillar removal in the "B" Shaft territory bounded by coordinates 400 to 600 S and 1400 to 1600 W between the 10th and 12th levels. Here the ore body dips at an angle of about 60° to the north under slate hanging wall. Rock-fill has been dumped into the lower part of this stope up to the level of the first row of pillars. After these have been trimmed, additional rock will be dumped to bring the fill up to the next row of pillars. Sometime in the first quarter of 1950 we expect to be able to start mining in this area and the microseismic recording apparatus will be set up to record any stresses developed in the back.

3. Cliffs Shaft and Bancroft Lease:

The following table shows pertinent data on the number and variety of contracts working in the mine.

<u>Month</u>	<u>Total Gangs</u>	<u>Double Gangs</u>	<u>Gangs Developing</u>	<u>% of Total</u>	<u>Gangs Drifting or Raising</u>	<u>% of Total</u>	<u>Gangs Using Carset Bits</u>
January	92	31	52	56.5	10½	11.4	34
February	93	31	49	52.7	12½	13.4	38
March	92	32	43	46.7	12	13.0	41
April	92	33	43	46.7	12½	13.6	45
May	94	34	54	57.4	10½	11.1	51
June	93	38	51	54.8	13½	14.5	60
July	90	38	47	52.2	11½	12.8	62
August	92	37	41	44.5	10½	11.4	63
September	92	35	48	52.2	12½	13.6	65
November	93	36	41	44.1	12	12.9	65
December	93	39	41	44.1	12½	13.4	68
Monthly Average	92.3	35	46.3	50.2	11.8	12.8	43
Year 1948				45.7			
Year 1947				46.0			
Year 1946				42.7			
Year 1945				45.7			
Year 1944				49.8			
Year 1943				54.9			

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

3. Cliffs Shaft and Bancroft Lease: (Cont'd)

The total number of gangs increased as did the number of gangs developing. This latter increase is appreciable and significant because we have the assurance of adequate reserves when development can be kept up around 50%. The number of double gangs increase by nearly 7. This program of changing over to two miners in a contract without a miner's helper was decelerated in 1949 in order to give us a chance to train our extra miners and arrange working partnerships that would be the most effective. Drifting and raising took up about the same percentage of our crews as in 1948. A new column has been added to the table showing the number of gangs using Carset bits with the sinker-Jackleg drilling equipment.

The diamond drill program started in late 1948 was continued through 1949. The purpose of this exploration was to test the ribs and floors of old workings in a systematic manner for ore reserves that might have been overlooked. It was expected that most of the holes drilled would be short - less than 100' in depth. The program as carried out on the sub-levels above 1st level, "B" Shaft, departed somewhat from the outlined procedure because a large vein of virgin ore was discovered about 20' south of the most westerly workings on the 1220' sub-level. Still farther south another series of veins intruded by dikes was also discovered. Altogether, this phase of the exploration was very satisfactory because the new ore will provide a much needed boost to the "B" Shaft reserves. Throughout the year this one diamond drill averaged 21.4% of its footage in ore. From a long-range viewpoint, we hope to be able to test all the old workings. From the knowledge obtained we can either eliminate them entirely from further consideration or plan the development of discovered reserves so as to consolidate the working gangs into a smaller territory and to some extent deplete the mine on some systematic basis.

With the exception of the new ore find above the 1st level, "B" Shaft, no large new areas of ore were discovered in 1949. The Section 10 Lease is not yet fully explored nor is the territory north of the old Moro workings. New ore will undoubtedly be found in the northeast part of the mine adjacent to the Harlow Clark-New York property. From the standpoint of acreage the Section 9 area is potentially the most promising virgin ground for added reserves. On the other hand, geological evidence indicates that hard ore veins in Section 9 are apt to be thin. Certainly additional diamond drilling from surface, is in order for Section 9. This should be done soon because if ore reserves there prove to be marginal from the standpoint of size and attitude they cannot be developed unless the rest of the mine is still operating on a full scale.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

3. Cliffs Shaft and Bancroft Lease: (Cont'd)

"A" SHAFT
1st Level

Three contracts did some development work on the 1st level, "A" Shaft, during 1949. In the early part of the year, Contract No. 18 completed a stope raise after 25' of advance to the west to coordinates 930 S - 470 E. When the stope raise got above the 1145' sub-level the ore vein became too thin to mine profitably and the stope was stopped. There is some possibility that the ore may continue in greater thickness southeast on the 1165' sub-level. This possibility will be explored in 1950. Three-hundred feet southeast, Contract No. 37 breast stoped 15' north from the north rib of old workings above the 1st level. They then advanced a narrow breast stope east for 45' to coordinates 1150 S - 640 E. This stope holed to the bench of an old stope raise and exhausted the reserves in this particular place. The third crew, No. 12, raise stoped from the 2nd level to the floor of an old stope on the 1st level. From there, in addition to mining the floor, they advanced a small breast stope 20' east to 320 S - 1520 E. More ore may be found in the ribs and floors of the contiguous 1st level workings. In fact, enough has been found in the floors 200' west of this location to warrant the development of a new raise from the 5th level. Probably the old workings will be explored by the diamond drill in the near future.

2nd Level

In the Bancroft Lease, Contract No. 29 breast stoped 40' northeast to 530 N - 1185 E. The ore vein is about 25' wide and occurs on the foot-wall dike in the nose of an eastward plunging syncline. Because we lacked proper raise facilities for removal of the ore the gang was moved out of this area until additional drift and a new raise could be developed from the 5th level. This will be done in early 1950. The only other development on the 2nd level was at 90 S - 900 E where Contract No. 5 drifted 30' southeast in a narrow vein of ore that pinched out between dike intrusives.

4th Level

Of the 4 contracts that engaged in development work on the 4th level during 1949, three are within 250' of "A" Shaft. Contract No. 27 advanced their breast stope 65' north to coordinates 230 S - 825 E. This development is subjacent to rock-filled 3rd level stopes. A new raise from 5th level was completed at the breast of the new stope near the end of the year. Cross cuts will be developed on both sides of the stope following a pattern which will preserve the pillar continuity from 3rd level. About 100' southwest of "A" Shaft, Contract No. 38 increased the outline of their stope on the 3rd level by back stoping in the north cross cut and raise stoping in the east end of their main stope to coordinates 610 S - 825 E. They also advanced a breast stope 50' west to 570 S - 590 E. In general, this ore vein is flat-lying with conglomerate ore directly beneath the slate hanging wall and specular hematite in the bottom three-quarters of the vein. There are cross cuts to be developed in addition to reserves in both the floor and back of this area. Two-hundred feet

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

3. Cliffs Shaft and Bancroft Lease: (Cont'd)

farther south, Contract No. 104 breast stoped 60' northeast to connect with the 4th level approach drift at 700 S - 750 E. They also breast stoped 30' where they holed to old workings at 790 S - 700 E. All of this ore has been discovered as the result of development consummated in connection with our plan to mine ore from the floor of a small 3rd level stope about 100' west of this location.

In the east end of the mine, Contract No. 8 was moved to a new location late in the year. They mined ore from the north rib of a stope developed by Contract No. 26 in 1948 at coordinates 160 S - 3570 E. We believe there is a good chance that this ore vein will bring us east into the old No. 3 Mine although its relative position seems to indicate that it will be a deposit missed by the No. 3 Mine.

5th Level

Four contracts did development work on the 5th level during 1949. Contract No. 9 put up a raise from the 5th level to the floor of the breast stope advanced by Contract No. 27 above the 4th level. This raise is 325' due north of "A" Shaft. About 200' east of "A" Shaft, Contract No. 28 started a development project early in the year by drifting 40' east through dike where they connected to old workings. The contract was stopped when the miner became ill and was not resumed in 1949. The purpose of the drift was to provide rail access to the old workings so that we could mine the ore in the floor of old stopes on the 4th level at 800 S - 1000 E and have a means of transporting the product to "B" Shaft. The "B" Shaft haulage system on the 5th level comes to the stope immediately south of "A" Shaft. It is less complicated to extend this haulage system than it would be to provide a pocket in "A" Shaft. Still farther to the east at 580 S - 1300 E, Contract No. 66 drifted south through the narrow dike that bounded their old stope on the south side. They then stoped both east and west in the 20' wide ore vein lying south of the aforementioned dike. The grade of the ore deteriorated in each end of the stope to such an extent that the stope was abandoned and the gang was moved to the 6th level. At coordinates 175 S - 1460 E, Contract No. 92 put up a flat short raise into the ore vein that constituted the downward extension of their old 4th level stope. They breast stoped this ore both to the east and west for a total length of 80' and width of 20'. Late in 1949 they had exhausted the ore in this stope and they were moved to the 7th level in the South Vein.

6th Level

As mentioned above, Contract No. 66 was moved to the 6th level. In the new location they breast stoped 30' southwest to coordinates 570 S - 1250 E. This ore vein strikes nearly east-west between dike footwall on the north and slate hanging wall on the south. Contract No. 51 spent most of their time mining floor but they advanced one breast stope 25' east to connect with old workings at 160 S - 2790 E. Contract No. 67 was also primarily a depleting gang in 1949 and they too advanced a breast stope except this one was 30' west to coordinates 350 S - 2740 E.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

3. Cliffs Shaft and Bancroft Lease: (Cont'd)

This ore vein may extend farther west but probably only at a lower elevation. In the southeast part of the mine, Contract No. 45 drove a stope 45' north from the north rib of a raise stope extending from the 6th to the 5th level. The breast stope cross-cut was advanced to the hanging wall contact of the ore vein which strikes east-west. Coordinate location of the breast of the stope is 1105 S - 2790 E.

7th Level

Contract No. 6 breast stoped south toward the footwall to reach coordinates 1150 S - 2190 E. This stope is 90' wide and 50' deep. West of this stope, Contract No. 92 started a new development by slicing ore from the south side of old workings at 1150 S - 2020 E. There is a good possibility that the ore will extend east to connect with the vein in which No. 6 Contract is stoping. In the northeast part of the mine a third gang, No. 61, made two breast stopes and enlarged a third by slicing ore from its south side. One breast stope was advanced west 40' to coordinates 200 N - 3475 E. This ore occurs between two dikes that strike nearly east-west. The other stope also strikes east-west but is south of the southernmost dike. It was advanced 40' east to 135 N - 3630 E. The slicing operation was at 100 N - 3400 E.

8th Level

The only crew that did development work in the Bancroft Vein on the 8th level was No. 10 Contract which breast stoped 35' east to 25 S - 2260 E. The ore vein is poorer in quality at the breast than the material already mined. Good ore does occur to the south but this will be on fee land because the newly developed stope is bounded on the south by the south boundary of the Bancroft Lease.

On fee property there were three crews that performed development work in 1949. Two-hundred feet east of "A" Shaft, Contract No. 41 extended a stub drift on the north side of the main haulage line. They advanced this 60' north to 465 S - 1060 E. From this drift, Contract No. 5 started a raise at 510 S - 1045 E. The raise will be put up to old workings northeast of "A" Shaft on the 5th level. From the top of this raise we will have access to mineable ore as high as the 2nd level. This is ore left behind in old workings. Contract No. 41 also drove 360' of drift as a by-pass haulageway to go around the track system through a large stope located at 175 S - 2250 E. In order to mine the ore in the floor of this stope it was necessary to provide a new haulageway into the North Vein. The new drift started northeast from 260 S - 2280 E and turned in a wide arc to the left so as to finish headed northwest where it holed to the old drift at 55 S - 2160 E. Strangely enough this new drift encountered a very appreciable vein of good ore north of the stope where we intend to mine floor. This is in an area considered by us to have been a poor prospect for any new ore vein. The third development contract to operate on fee property was No. 81 which is located in the northeast extremity of the 8th level. This crew mined floor but also drove 20' of breast stope north to 210 N - 3310 E, and 45' of breast stope west to 160 N - 3210 E. This ore vein is in a relatively little developed area of the mine. While not too

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

3. Cliffs Shaft and Bancroft Lease: (Cont'd)

much is known of the attitude and relationship of the ore-bearing horizon to hanging and footwall in this territory, we are led to believe from the occurrences now developed that the ore horizon strikes northeast-southwest and plunges west, probably along the south limb of a syncline.

9th Level

Contract No. 16, the only development crew to work on the Bancroft Lease 9th level, breast stoped 40' southwest to 160 N - 1555 E. We plan to drift from this location to encounter a raise that extends up from the 10th level. This will simplify the ore scraping from No. 16 stope.

There were five crews that engaged in development work on the 9th level on fee property during 1949. Nearest the shaft, Contract No. 46 advanced their breast stope 75' east in a vein of ore 30' wide to reach coordinates 575 S - 1585 E. The ore extends all the way down to the 10th level and ahead 40' to old workings. It is a footwall ore vein. Contract No. 90 raise stoped 115' west from old workings to reach the location at 850 S - 1600 E well above the 9th level. More ore can be mined from this area but it will not be mined until a new drift on the 10th level and a new raise have been developed. At the present time the ore has to be scraped 400' east to a raise on the 10th level where it falls to the 15th level. At the end of the year, Contract No. 96 had reached a position about 20' above the 9th level at 190 S - 2230 E with the raise they were putting up from the 10th level. This raise will tap the ore in the floor of the 8th level stope above this location. In a narrow east-west ore vein located along the 435 S coordinate line, Contract No. 35 advanced two breast stopes, one west to 2645 E, the other east to 2705 E. This ore vein is apparently in the middle of the ore horizon and bears little relation to any observed structural control. Contract No. 101, the fifth development gang, advanced a breast stope cross-cut to the north of their main east-west stope. The breast of the cross cut is located at 350 N - 3570 E. They also extended their main stope and made it much wider at 290 N - 3640 E. This ore vein occurs at or near the east end of a westward plunging syncline whose south limb has been faulted up. The ore should consequently swing northeast around the fold of the syncline. The development of the cross cut to the north seems to bear out this contention.

10th Level

In the midwestern part of the Bancroft Vein above the 10th level elevation, Contract No. 69 breast stoped 90' southwest on Bancroft property and continued 40' farther on Cliffs Shaft fee property. The ore body is relatively **flat-lying** under slate hanging wall. In order to reduce the distance required for scraping the ore to be mined from cross cuts and floor of the new stope advanced by Contract No. 69, we planned a new raise to hole near the breast of the new stope. Contract No. 44 started a drift in December 1949 which they will advance south about 200' to reach the point where this raise can be put up to 69 stope. By the end of the year the drift had been advanced 60' south to 45 N - 1790 E. At the east end of the Bancroft Vein, Contract No. 70 stripped ore from the north side of

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

3. Cliffs Shaft and Bancroft Lease: (Cont'd)

the drift that crosses the east boundary of the lease. In all, this crew stripped 12' to 15' of ore along 130' of the drift. Only 33' of this length, however, was on the Bancroft Lease side of the boundary at coordinates 250 N - 2650 E.

There were 11 contracts that did development work on the 10th level Cliffs Shaft fee property in 1949. Contract No. 44 advanced a drift 180' north to 500 S - 1565 E. This is under No. 46 stope on the 9th level and from the drift Contract No. 26 put up a raise to the floor of the stope Contract No. 46 was advancing east. The drift and raise both encountered ore which is the downward extension of the vein being stoped above. Two-hundred feet southeast, Contract No. 15 drifted 70' south at an elevation 25' below the 10th level. The drift reached the coordinate location 710 S - 1740 E. From the west side of the drift this crew drove a narrow breast stope west to 660 S - 1710 E. To date this development indicates the ore vein is narrow and some of it of questionable grade. In the Southeast Vein, Contract No. 26 drove an incline drift from the 10th level to the floor of No. 65 stope on the 9th level. The ore-pass drift holed at 905 S - 2325 E. Two-hundred feet east, Contract No. 3 advanced two breast stopes. One was headed northwest and reached coordinates 980 S - 2430 E. The other was advanced 20' south to 1035 S - 2505 E. Approximately another 300' east, Contract No. 55 made wider the raise connecting their lower stope and upper stope. They also breast stoped 30' southeast to the coordinate location 1030 S - 2710 E. In the Main Vein, Contract No. 35 breast stoped 40' southeast from the haulage drift to connect with a lateral drift and thereby formed a pillar. Contract No. 96 put up a raise from the 10th level to the 8th level at coordinates 235 S - 2205 E. This raise will serve as an ore pass for the ore to be mined from the floor of a large stope. As mentioned under the discussion of the Bancroft Vein, Contract No. 69 advanced a breast stope southwest across the lease boundary onto fee property at 55 S - 1760 E. In the northeast part of the mine on the 10th level, Contract No. 44 was active in the first part of the year driving two drifts. The first was an extension east of the main line for 155' to 320 N - 3665 E. This was advanced in order to put up a raise to the east end of 101 stope on the 9th level. The raise work was done by No. 78 Contract. The other drift made by 44 Contract was an exploratory lateral to the northeast which was stopped after 140' of advance at 400 N - 3370 E. The exploration was successful in find ore and Contract No. 53 stoped along the side and in the back of the drift at 375 N - 3330 E. The last gang that did development work was Contract No. 23 which advanced a breast stope 45' wide for 50' to the northeast on an elevation just below the 9th level. The breast of the stope was located at year's end at 80 N - 2840 E.

The ore discovered by the drift that 44 Contract drove northeast was, as mentioned above, partly stoped by Contract No. 53. This ore occurs, we believe, at the east end of the Bancroft Vein syncline which here plunges west. Much more ore ought to occur both above and below the 10th Level. To get the ore below the 10th level we need a raise from the 15th level. Sometime in 1950 we expect to put up such a raise.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

3. Cliffs Shaft and Bancroft Lease: (Cont'd)

11th Level

Four different crews engaged in development work in the Bancroft Vein during 1949. A fifth worked in the same ore vein where it extends across the east lease boundary onto Cliffs Shaft fee property. The most westerly gang, Contract No. 84 stoped 35' northeast to 275 N - 2325 E. This is a hanging wall ore vein most of which is conglomeritic. It is second-class in quality regarding the iron content but silica is low. Apparently lime is the element that occupies the percentage silica generally holds. About two-hundred feet southeast, Contract No. 62 breast stoped 80' southwest to 170 N - 2400 E. They also advanced a cross cut stope south 15' to 150 N - 2460 E. This ore vein is also classified by its position as a hanging wall ore body but the ore is not the same in character as that in No. 84 Contract's stope. In order to reduce the scraper haul in No. 62 we had Contract No. 78 put up a branch raise at 165 N - 2450 E from an elevation slightly below the 12th level. About 100' to the south of No. 62 stope, Contract No. 53 breast stoped 25' east to 85 N - 2530 E. This development will be continued because good ore occurs in the breast of the stope. This ore vein can be classified as a footwall ore body.

Only two crews were developing in the fee area of the 11th level in 1949. Contract No. 91 advanced a breast stope 60' south through a large pillar about 150' long. From this stope they developed a short cross cut to the east near 640 S - 2320 E. The second development gang was No. 68 which raise stoped 50' west to hole to the floor of 10th level stopes at 665 S - 2760 E.

12th Level

Only one crew did any development work in 1949 on the 12th level. This was No. 24 which stripped ore from the south side of a drift at 630 S - 2360 E.

"B" SHAFT

1st Level and Sub-Levels above the 1st Level

On the 1220' sub-level, Contract No. 73 drifted 20' east to connect two old stopes at 845 S - 470 W. Good ore was found along the south rib and in the south bench of this development. On the 1205' sub-level, Contract No. 17 breast stoped 95' east to connect with an old cross cut stope at 800 S - 385 E. This is a conglomerate ore vein that dips north under slate hanging and above a slate seam footwall. Some specular ore may be found under this slate seam although in most of the area it has been mined. Three crews did development work on the 1165' sub-level. Contract No. 1 put up 25' of raise stope from old workings and holed to a stope on the 1205' sub-level at 1165 S - 350 E. Contract No. 58 extended a breast stope 20' south to 860 S - 200 W, where they encountered material too lean to continue. Contract No. 76 put up a raise from the 2nd level which holed to an old stope on the 1145' sub-level and then continued the raise up to the floor of an old stope on the 1165' sub-level. On that elevation they

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

3. Cliffs Shaft and Bancroft Lease: (Cont'd)

started a breast stope south which was advanced to 800 S - 590 W. This development was discontinued temporarily until No. 73 Contract could finish barring an adjacent stope in which they were working. On the 1145' sub-level, Contract No. 1 drifted 30' east to 1280 S - 330 E. This development is on the Section 10 Lease and was previously described under that heading. Contract No. 75 advanced a breast stope 15' west to 1160 S - 330 W. The material now exposed at the breast is lean in quality. Contract No. 76, as mentioned above, holed a raise to an old stope and extended it up through the back to the 1165' sub-level.

On the 1st level, Contract No. 73 drove 85' of drift southwest to hole to an old stope at 730 S - 460 W. This drift was driven to provide means of getting a scraper slide into the old stope so that we could load the ore that Contract No. 73 was to mine on the sub-levels above.

2nd Level

As mentioned in the foregoing description of development, Contract No. 76 started a raise from a point above the 2nd level which went to the 1165' sub-level. This raise was an extension of an old raise that came up from a stope on the 4th level. At the 4th level we holed to the foot of this raise with a new raise put up from the 5th level. Thus, it is now possible to bring out on the 5th level haulage system the ore mined on the 1145', 1165' or 1205' sub-levels. The only other crew to do any development work on the 2nd level was No. 72 Contract. They connected two old stopes with 30' of new breast stope driven south, which holed at 160 S - 180 W. Later in the year this crew advanced a breast stope 25' north to 80 S - 200 W. Some good ore can be mined by raise stoping in this last developed stope.

3rd Level

From the elevation of the 3rd level, Contract No. 86 put up a branch of their ore raise to the floor of a stope they had previously developed. The location of the top of the raise was at 355 S - 480 W.

4th Level

Five contracts did development work on the 4th level in 1949. Contract No. 11 advanced a breast stope 70' east to 260 S - 40 W. The material in the breast is of poor quality. They also breast stoped 40' west to 280 S - 185 W where they likewise encountered lean material. To the north, however, they discovered a vein of ore when they drifted 60' north. All of this drift is in ore after penetrating 20' of dike adjacent to the north rib of the stope. The breast of the drift is at 155 S - 125 W. A new raise was started on the 5th level to facilitate the mining of the new ore vein. About 250' west of No. 11 stope, Contract No. 13 breast stoped 45' north in an attempt to develop the ore shown in diamond drill hole No. 78. The stope was stoped at 200 S - 370 W. The vein is apparently too narrow to amount to much. Contract No. 33 breast stoped 50' east to 510 S - 70 W and started a cross cut south at 550 S - 100 W. The east breast exposes ore of good quality that probably will

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

3. Cliffs Shaft and Bancroft Lease:

extend 125' farther east to the old 4th level workings south of "B" Shaft. Contract No. 57 spent the whole year breast stoping east. They mined the upward extension of old 5th level stopes leaving a floor pillar of ore between. Total advance for the year was 85' to coordinates 130 N - 165 E. Contract No. 63 holed a raise from the 5th level at 560 S - 570 W. This is the raise through which ore, mined by 76 Contract on the 1165' sub-level, is removed.

5th Level

There were 6 contracts engaged in development work on the 5th level. In the early part of 1949, Contract No. 32 drifted 110' northeast to 450 S - 225 W. From this drift, Contract No. 85 put up a raise to the old part of 33 stope on the 4th level. The raise holed at 490 S - 215 W. From it we depleted floor of 33 stope. In order to mine the ore in the floor of the 1st level stopes in the southwest ore vein we had to have a way to remove the ore. Some of the ore extends down to the 3rd level elevation. In 1948 a drift was driven south and east on the 5th level to get under this ore vein. In 1949 two raises were started from this drift both of which will hole to the 1st level. Contract No. 52 started a raise at 1325 S - 75 W and Contract No. 64 started one at 1330 S - 25 W. Contract No. 63 drifted 305' southwest and south to 630 S - 550 W and put up a raise from 575 S - 560 W to a 4th level stope where the ore mined by No. 76 Contract on the 1165' sub-level accumulates. This development was the final link in the provision of a means for getting the sub-level ore out on the 5th level. Contract No. 71 breast stoped 30' southwest to 540 S - 670 W in a stope located below the 5th level in a footwall ore body.

6th Level

During 1949, Contract No. 56 continued their breast stope east. They advanced it 60' to hole to old workings at 530 S - 685 W.

7th Level

Contract No. 77 breast stoped 40' northeast and then 12' west in the vicinity of 80 N - 210 W. This development is along the footwall between old workings that have already been developed to the footwall. Contract No. 87 continued to advance their breast stope west. They are headed toward the slate hanging wall. Total progress was 40' to coordinates 95 S - 500 W.

9th Level

Working on an elevation about midway between the 9th and 10th levels, Contract No. 14 breast stoped 40' east under the floor of older workings on the 9th level. The floor pillar had to be left because the old stope is a transfer point for ore mined up above on the 6th level. The new stope was inclined at the east end and holed to the 9th level stope at 710 S - 1175 W. In the latter half of 1949, Contract No. 42 switched from depletion to development mining. They put up a raise stope to the south-east which holed to an old raise stope at 380 S - 820 W. From this point good ore extends northeast which we expect to develop in the future.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

3. Cliffs Shaft and Bancroft Lease: (Cont'd)

10th Level

Contract No. 100 advanced a breast stope 35' east to connect two stope laterals and form a pillar. The cross cut holed at 510 S - 1000 W.

11th Level

Contract No. 19 is a double mining contract. In 1949 they breast stoped and then raised up at the end of this stope to hole to the floor of a 10th level stope located at 665 S - 1160 W. The total advance in this heading was 75'. The other heading was also a breast stope which they advanced 80' southeast to 610 S - 1075 W. We have reasonably good reason to expect that this ore which is along the footwall will extend both southwest and northeast in spite of the fact that the diamond drill hole to the northeast shows no ore. Actually the development is above the elevation of the drill hole.

14th Level

Contract No. 48 advanced a breast stope 25' northwest to coordinate location 245 S - 1620 W. The material exposed in the breast is too lean to constitute ore. Therefore, we do not believe any more ore will be found in this direction.

15th Level

Above the 15th level, Contract No. 43 extended their raise stope 20' west to 490 S - 1500 W. They also extended the south rib of the stope 15' to 510 S - 1465 W. This footwall ore is extremely dense and hard. It poses the most difficult drilling problem of any place in the mine. The other crew, No. 47, which worked on the 15th level also did development work. They developed a small breast stope 80' long east-west which ran into lean material at 50 S - 1700 W. Actually, they depleted all the ore in their development operation because the vein pinches out between dike foot and dike hanging wall.

3. Cliffs Shaft, Bancroft and Section 10 Lease:

The following table shows the gangs that did development work during 1949. The tonnage after each is the amount broken by these crews in development and allocated to the proper level.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)a. Development: (Cont'd)3. Cliffs Shaft, Bancroft and Section 10 Lease: (Cont'd)

<u>"A" SHAFT</u>	<u>Contract Number</u>	<u>Mine Tally</u>		<u>Shifts Mining</u>	<u>Shifts Barring While Developing</u>
		<u>Ore</u>	<u>Rock</u>		
1st Level	37	2,292		132 $\frac{1}{2}$	
2nd "	29	1,326	31	159	5
4th "	2	8,333	15	468	8
	27	3,504		237	5
	38	7,941		181	2
	104	6,574	36	420	
5th "	4	347	2,407	410	
	9		66	25	
	21	7,298		245	
	25	4,468		377 $\frac{1}{2}$	92 $\frac{1}{2}$
	28		189	42 $\frac{3}{4}$	
	45	5,177		285	
	66	2,392	648	334	6
	74	6,355	5	465 $\frac{1}{2}$	
	92	413		48	
6th "	8	347		28	
7th "	6	5,299		217	27
	61	2,356	71	249	12
	80	4,054		295 $\frac{1}{2}$	
	92	1,816		81	
8th "	10	3,402		171	60
	40	6,656		472	
	41	2,025	3,371	381 $\frac{1}{2}$	
	78		372	46 $\frac{1}{2}$	
	81	3,356		273	13
	96	413	666	157	
9th "	7	6,712		455 $\frac{1}{2}$	22
	16	4,294	26	467	22
	23	4,218		183	8
	35	2,249	10	341 $\frac{1}{2}$	21
	46	2,948	15	242 $\frac{1}{2}$	2
	65	2,882		176	26
	69	2,479		319	6
	90	1,538		242	
	95	199	102	28	
	101	3,998	102	230	13
10th "	3	7,964		236	9
	9	77	424	99	
	15	2,037		235	7
	26	449	699	200 $\frac{1}{2}$	7
	44	3,259	3,820	472 $\frac{1}{2}$	6
	96	428		99	10

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)a. Development: (Cont'd)3. Cliffs Shaft, Bancroft and Section 10 Lease: (Cont'd)

	<u>Contract Number</u>	<u>Mine Tally</u>		<u>Shifts Mining</u>	<u>Shifts Barring While Developing</u>
		<u>Ore</u>	<u>Rock</u>		
<u>"A" SHAFT</u>					
11th Level	53	1,821	265	79	3
	55	9,290		441	47
	62	4,396	66	413 $\frac{1}{2}$	13
	68	5,103		336	11
	70	1,010		71	1
	78	107		65	
	84	2,968		126	5
	91	3,886	5	244	
Total "A" Shaft		160,456	13,411	12,004	469 $\frac{1}{2}$
<u>"B" SHAFT</u>					
1st Level	17	1,795		152	
	73	757	69	66	
	75	1,828	110	160	2
	76	184		62	13
2nd "	72	969		64	
	76			130	38
	86	2,698		161	
4th "	11	6,956	311	481	
	13	2,066	1,117	270 $\frac{1}{2}$	72
	33	9,262	5	486	
5th "	32	918	388	78	
	52	214	418	89	2
	57	4,784		235	5
	63	1,484	872	456 $\frac{1}{2}$	2
	85	357		60	
	86	219	224	67	5
6th "	56	3,086		286	27
7th "	77	4,294		238	4
	87	4,916		169 $\frac{1}{2}$	2
9th "	14	3,305	117	172 $\frac{1}{2}$	
11th "	19	7,033		356	
15th "	43	2,004		228	
	47	745		130	
Total "B" Shaft		59,874	3,631	4,598	172
Grand Total Developing		220,330	17,042	16,602	641

The contract sheet tonnage exclusive of overrun equals 483,948 tons. The 220,330 tons mined by development crews is 46% of the total or 10% more than last year's proportion.

The table below gives the mine tally production totals without overrun for the past six years:

1944	569,871 Tons
1945	535,454 "
1946	386,160 "
1947	531,971 "
1948	573,455 "
1949	481,855 "
Total	3,078,766 "

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

3. Cliffs Shaft, Bancroft and Section 10 Lease: (Cont'd)

Developing gangs have mined the following tonnages during the past six years:

1944	206,926 Tons
1945	184,510 "
1946	119,649 "
1947	185,339 "
1948	208,478 "
1949	220,330 "
Total	1,125,232 "

From 1944 to 1950, developing gangs mined 1,125,232 tons (36.5%) per the contract sheet tally and depleting gangs mined 1,953,534 tons (63.5%) making a total of 3,080,146 tons. Total mine tally by skip count for the same period is 3,078,766 tons without overrun.

The following table gives the average number of development gangs, the tonnage mined by them, the shifts involved and the tons per gang per shift for the past six years:

<u>Year</u>	<u>Avg. No. of Gangs on Ore Development</u>	<u>Tonnage Mine Tally</u>	<u>Shifts Worked</u>	<u>Tons Per Gang Per Shift</u>
1944	48.1	206,926	14,786 $\frac{1}{2}$	13.99
1945	38.5	184,510	11,395	16.19
1946	36.8	119,649	8,727 $\frac{1}{2}$	13.71
1947	41.7	185,339	14,690 $\frac{3}{4}$	12.62
1948	41.2	208,478	16,991 $\frac{3}{4}$	12.27
1949	46.3	220,330	17,243	12.78

b. Stopping:

<u>"A" SHAFT</u>	<u>Contract Number</u>	<u>Location by Coordinates at Approx. Center of Operations</u>	<u>Character of Work</u>
1st Level	12	320 S - 1500 E	Mining Floor
	18	860 S - 520 E	" Back
	30	270 S - 800 E	" Floor
2nd "	34	210 S - 490 E	" "
	12	310 S - 1500 E	" Back
	12	465 S - 1320 E	" "
4th "	22	70 S - 1000 E	" "
	30	270 S - 750 E	" Pillars
	34	150 S - 410 E	" "
5th "	22	140 S - 1260 E	" "
	38	560 S - 720 E	" Back
	92	180 S - 1520 E	" Bench
5th "	8	380 S - 3350 E	" Floor
	45	1215 S - 2790 E	" Bench
	66	550 S - 1280 E	" Floor

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)b. Stoping: (Cont'd)

	<u>Contract Number</u>	<u>Location by Coordinates at Approx. Center of Operations</u>	<u>Character of Work</u>
<u>"A" SHAFT</u>			
6th Level	31	250 N - 3600 E	Mining Floor
	45	1160 S - 2770 E	" Bench
	51	220 S - 2540 E	" Floor
	59	390 S - 1780 E	" Floor & Pillar
	67	415 S - 3025 E	" "
	98	480 S - 1670 E	" "
7th "	20	200 S - 2300 E	" Bench
	39	390 S - 2180 E	" Floor
	61	150 N - 3500 E	" "
	82	150 S - 1730 E	" "
	98	530 S - 1650 E	" "
	98	20 S - 2070 E	" Bench
8th "	20	170 S - 2140 E	" Floor
	54	230 S - 1840 E	" "
	78	15 N - 3100 E	" "
	81	160 N - 3310 E	" "
9th "	7	425 S - 2360 E	" "
	23	80 N - 2850 E	" "
	32	460 S - 2050 E	" Pillar
	35	540 S - 2750 E	" Back
	54	240 S - 1900 E	" Bench
	65	910 S - 2350 E	" Floor
	78	10 N - 3075 E	" "
	95	300 S - 2775 E	" "
10th "	7	460 S - 2375 E	" Back
	15	580 S - 1780 E	" Floor
	32	460 S - 2060 E	" Bench
	55	960 S - 2660 E	" Floor
	68	670 S - 2780 E	" "
11th "	79	610 S - 2110 E	" "
	83	600 S - 2425 E	" Back
12th "	24	600 S - 2330 E	" Floor
	60	590 S - 2700 E	" "
	79	660 S - 2190 E	" "
<u>"B" SHAFT</u>			
Sub-levels			
above 1st-1145'	1	1260 S - 160 E	Mining Floor
" 1165'	58	825 S - 210 W	" "
	73	825 S - 580 W	" Bench
	85	1190 S - 10 E	" "
" 1205'	73	825 S - 625 W	" Floor
1st Level	1	1280 S - 300 E	" Back
	34	150 S - 380 E	" Pillar
	58	650 S - 500 W	" "
	75	1225 S - 100 W	" Back
2nd "	34	150 S - 360 E	" Bench
	58	650 S - 510 W	" "
	86	350 S - 525 W	" Floor
3rd "	13	270 S - 350 W	" Bench

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)b. Stoping: (Cont'd)

	<u>Contract Number</u>	<u>Location by Coordinates at Approx. Center of Operations</u>	<u>Character of Work</u>
<u>"B" SHAFT</u>			
5th Level	37	560 S - 480 W	Mining Bench
	57	140 N - 75 E	" "
	71	510 S - 750 W	" "
6th "	49	800 S - 1500 W	" Floor
	56	525 S - 785 W	" "
7th "	87	90 S - 375 W	" "
9th "	42	420 S - 870 W	" "
10th "	93	315 S - 790 W	" "
	100	520 S - 1050 W	" Back
14th "	36	60 S - 1500 W	" Bench
	48	290 S - 1625 W	" Floor
	48	315 S - 1550 W	" "
15th "	43	500 S - 1480 W	" Back

The table below shows the ore broken by the stoping gangs mining developed reserves:

	<u>Contract Number</u>	<u>Mine Tally</u>		<u>Shifts Mining</u>	<u>Shifts Barring While Depleting</u>
		<u>Ore</u>	<u>Rock</u>		
<u>"A" SHAFT</u>					
1st Level	30	3,203		210 $\frac{1}{2}$	6
	34	7,115		206	42
	37	852		32	
2nd "	5	189		75 $\frac{1}{2}$	
	12	4,835	92	208 $\frac{1}{2}$	21
4th "	8	872		54	
	22	3,922	556	162 $\frac{1}{2}$	70 $\frac{1}{2}$
	38	4,636		75	
	104	1,862		66	
5th "	8	3,035	4	163	
	45	3,397		202 $\frac{1}{2}$	
	92	3,188	235	110	2
6th "	31	4,503	112	233 $\frac{1}{2}$	5
	51	7,941	46	245	
	59	5,845		304	67
7th "	20	2,402		49	
	39	2,989		208	65
	54	4,621		237	3
	61	5,243	228	228	
	67	5,128		210	18
	80	2,142		171	
	82	5,620	260	239	
	98	5,840		319	114
8th "	20	7,625		168	49
	78	4,208		193	6
	81	3,463		202	
9th "	23	1,923	15	42 $\frac{1}{2}$	11
	32	2,958		126	23
	35	1,372		124	
	65	862		44	
	69	2,020		146	4
	95	4,442		189	23

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)b. Stoping: (Cont'd)

	<u>Contract Number</u>	<u>Mine Tally</u>		<u>Shifts Mining</u>	<u>Shifts Barring While Depleting</u>
		<u>Ore</u>	<u>Rock</u>		
<u>"A" SHAFT</u>					
10th Level	70	3,657		154½	14½
	89	8,170		227	18
11th "	39	2,058		96½	5
	53	5,279		142	21
	60	7,479		480	6
	79	5,108		242	1
	83	6,431		402	83½
12th "	24	6,344		460	47
Total "A" Shaft		162,779	1,320	7,447½	725
<u>"B" SHAFT</u>					
1st Level	1	5,337	43	461	5
	17	1,425		89	2
	18	2,190	105	228	11
	58	2,055		152	
	73	3,353		229	67
	75	1,634		81	
	85	2,203		131	4
2nd "	58	4,292		289	8
	72	3,616	434	178	1
	86	2,570		82	
4th "	13	2,081		101	
5th "	71	9,241		426	46
	85	678		30	
6th "	37	974		73	
	49	14,882		483½	
	56	2,978		174	
7th "	87	2,530		72	
9th "	14	2,474		72	
	42	71		181	
10th "	93	3,891		221	26
	100	5,426		231	3
11th "	19	4,350		118	
14th "	36	9,333		242½	2
	48	10,348		223	5
15th "	43	1,448		110	
	47	1,459		57	
Total "B" Shaft		100,839	582	4,735	180
Grand Total Dep.		263,618	1,902	12,182½	905

The contract sheet tonnage exclusive of overrun was 483,948 tons of which the depleting gangs broke 263,618 tons or 54%. This is 10% less than last year's proportion.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

b. Stoping: (Cont'd)

The following table gives a six year comparison:

<u>Year</u>	<u>Avg. No. of Gangs Stopping</u>	<u>Tonnage Mine Tally</u>	<u>Shifts Worked</u>	<u>Tons Per Gang Per Shift</u>
1944	48	364,650	13,984	26.07
1945	46	350,312	13,619 $\frac{1}{4}$	25.72
1946	49	266,278	10,505 $\frac{1}{4}$	25.35
1947	49	344,333	14,917	23.08
1948	49	365,723	18,066 $\frac{1}{2}$	20.24
1949	46	263,618	13,087 $\frac{1}{2}$	20.14

c. Drifting and Raising:

<u>Year</u>	<u>Rock Drifts and Raises</u>	<u>Ore Drifts and Raises</u>	<u>Total</u>
1940	1,756'	3,242'	4,998'
1941	2,196'	3,411'	5,607'
1942	2,855'	3,166'	6,021'
1943	5,180'	4,059'	9,239'
1944	3,814'	4,108'	7,922'
1945	1,969'	3,153'	5,122'
1946	1,873'	2,557'	4,430'
1947	3,221'	2,952'	6,173'
1948	3,068'	4,213'	7,281'
1949	2,498'	2,047'	4,545'

d. Explosives, Drilling and Blasting:

Powder consumption per ton of ore decreased .0436 lbs. per ton compared to 1948 usage. The average price for Gelamite increased from \$14.816 to \$15.25. The average price of Hercomite 2X increased from \$13.957 to \$14.50. In spite of this, the cost per ton for powder dropped .0012 because of the reduction in consumption. This is in turn attributable to the smaller size holes being drilled with Carset bits.

The powder consumption per foot of rock development increased 0.6 lbs. per foot of development compared to 1948 practice as shown in the table below:

<u>Year</u>	<u>Pounds of Powder Per Foot of Rock Development</u>
1945	21.6 Gelamite
1946	17.0 Hercomite 2X
1947	17.8 " 2X
1948	16.5 " 2X
1949	17.1 " 2X

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND: (Cont'd)

d. Explosives, Drilling and Blasting: (Cont'd)

Statement of Explosives Used: (Stoping and Development in Ore)

	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1949</u>	<u>Amount 1948</u>
Gelamite No. 1 - CWT.	79,750	15.25	12161.89	11927.28
Hercomite No. 2X - CWT.	348,725	14.50	50563.13	65564.83
H.P. Gelamite - 60%	200	20.00	40.00	70.00
Total Powder	428,675	14.64	62765.02	77562.11
Fuse - Ft.	729,780	8.33 M	6077.90	6775.71
No. 6 Caps	112,320	14.70 M	1651.78	1720.48
E. B. Caps No. 6	13,747	16.50 C	2268.42	1977.39
Fuse Lighters (7 in.)	37,400	8.95 M	334.45	348.15
No. 18 Shot Wire - Ft.	4,005	11.815 M	47.26	123.22
Tamping Bags	4,570	6.69 M	30.59	83.99
Powder Bags				54.00
Connecting Wire - Lbs.	439	.786	345.05	350.08
Miscellaneous			90.58	268.83
Total Fuse, Etc.			10846.03	11701.85
Total Stoping & Dev. in Ore			73611.05	89263.96
Product - Tons			492,405	602,453
Lbs. Powder Per Ton Ore			.8705	.9141
Cost Per Ton For Powder			.1275	.1287
Cost Per Ton For Fuse, Etc.			.0220	.0194
Cost Per Ton For All Explosives			.1495	.1481
(Development in Rock)				
Hercomite No. 2X - CWT.	42,575	14.50	6173.38	7043.67
Gelamite No. 1 - CWT.	300	15.25	45.75	-
Total Powder	42,875	14.51	6219.13	7043.67
Fuse - Ft.	12,890	8.32 M	107.18	142.94
No. 6 Caps	2,175	14.70 M	31.88	41.96
E. B. Caps No. 6	10,196	15.90 C	1621.10	1350.26
Fuse Lighters	5,100	9.43 M	48.10	87.60
No. 18 Shot Wire - Ft.	2,750	11.665 M	32.08	85.82
Tamping Bags	300	.90 M	2.81	2.89
Connecting Wire - Lbs.	308	.80	246.67	250.24
Miscellaneous			50.50	96.86
Total Fuse, Etc.			2140.32	2058.57
Total Rock Development			8359.45	9102.24
Feet Rock Development			2,498	3,068
Cost Per Foot Rock Development			3.346	2.966
GRAND TOTAL ALL EXPLOSIVES			81970.50	98366.20
AVERAGE COST PER LB. FOR POWDER			.1463	.1406

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

8. COST OF
OPERATING:

a. Comparative Mining Costs:

	<u>1949</u>	<u>1948</u>
Product - Tons	492,405	602,453
Underground Costs	3.001	2.807
Surface Costs	.536	.432
General Mine Expense	<u>.577</u>	<u>.495</u>
Cost of Production	4.114	3.734
Taxes	.317	.326
Depreciation	.034	.069
Loading & Shipping	<u>.094</u>	<u>.085</u>
Total Cost At Mine	4.559	4.214
Budget Estimate At Mine	4.449	4.210
No. of Days Operating	245	307
No. of Shifts and Hours	2-8 hr.	2-8 hr.
Average Daily Product	2010	1962

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison
Details of Accounts

	<u>Total 1949</u>		<u>Total 1948</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>Underground Costs</u>				
Exploring in Mine	9449.06	.019	1279.07	.002
Development in Rock	68614.14	.139	75849.62	.126
Development in Ore	61616.54	.125	92875.57	.154
Stoping	811462.01	1.648	911038.66	1.512
Timbering	35960.02	.073	48842.32	.081
Tramming	149815.08	.304	179174.13	.297
Ventilation	1303.99	.002	807.69	.001
Pumping	34746.21	.071	38394.91	.064
Compressors & Air Pipes	54736.69	.111	72832.12	.121
Back Filling	2009.30	.004	2130.03	.003
Underground Superintendence	53842.30	.109	59937.06	.100
Comp. & Power Drills	25709.88	.052	26034.91	.043
Scrapers & Mech. Loaders	104737.95	.213	115011.73	.192
Tramming Equipment	56855.11	.115	57273.08	.095
Pumping Machinery	7020.61	.014	9757.51	.016
Total Underground Costs	<u>1477878.89</u>	<u>3.001</u>	<u>1691238.41</u>	<u>2.807</u>
<u>Surface Costs</u>				
Hoisting	45162.93	.092	48980.73	.081
Stocking Ore	30368.81	.062	32554.55	.054
Screening-Crushing-Mine	64656.14	.131	63738.84	.106
Dry House	16301.54	.033	19039.69	.032
General Surface Expense	21940.20	.045	34923.79	.058
Maint. Hoisting Equip't.	16574.59	.034	20453.06	.034
Shaft	5722.95	.012	6738.47	.011
Top Tram Equipment	10703.60	.022	7769.48	.013
Docks, Trestles & Pockets	16170.99	.033	8597.96	.014
Mine Buildings	36254.39	.074	17422.59	.029
Total Surface Costs	<u>263856.14</u>	<u>.536</u>	<u>260219.16</u>	<u>.432</u>
<u>General Mine Expense</u>				
Geological	4855.41	.010	4141.68	.007
Mining Engineering	8773.76	.018	7697.50	.013
Mech. & Elec. Engineering	5069.20	.011	4116.52	.007
Analysis & Grading	34885.44	.071	29648.32	.049
Safety Department	4297.26	.009	3994.92	.007
Tel. & Safety Devices	9301.24	.019	10593.34	.018
Local & Gen. Welfare	5045.05	.010	6138.62	.010
Spec. Exp. Pens. & All.	2481.95	.005	11422.99	.019
Ishpeming Office	27892.19	.057	40528.28	.067
Mine Office	34768.11	.071	34676.48	.058
Insurance	28626.79	.058	21561.99	.036
Personal Injury	31128.99	.063	35423.17	.059
Social Security Taxes	28848.83	.059	30532.92	.051
Employees Vacation Pay	57908.65	.118	57877.24	.096
Research Laboratory	202.54	-	-	-
Total Gen. Mine Expense	<u>284085.41</u>	<u>.577</u>	<u>298353.97</u>	<u>.495</u>
Cost of Production	<u>2025820.44</u>	<u>4.114</u>	<u>2249811.54</u>	<u>3.734</u>

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison:
Details of Accounts:

	<u>L A B O R</u>				<u>S U P P L I E S</u>			
	<u>1949</u>	<u>Per</u>	<u>1948</u>	<u>Per</u>	<u>1949</u>	<u>Per</u>	<u>1948</u>	<u>Per</u>
	<u>Amount</u>	<u>Ton</u>	<u>Amount</u>	<u>Ton</u>	<u>Amount</u>	<u>Ton</u>	<u>Amount</u>	<u>Ton</u>
<u>Underground Costs</u>								
Exploring in Mine	6244.83	.013	895.88	.001	3204.23	.006	383.19	-
Development in Rock	53452.09	.108	57440.20	.095	15162.05	.031	18409.42	.031
Development in Ore	48060.90	.098	73743.64	.122	13555.64	.027	19131.93	.032
Stoping	660346.03	1.341	748433.86	1.240	151115.98	.307	162604.80	.270
Timbering	20030.54	.041	30365.84	.050	15929.48	.032	18476.48	.031
Tramming	139998.01	.284	169142.97	.281	9817.07	.020	10031.16	.017
Ventilation	126.24	-	179.21	-	1177.75	.002	628.48	-
Pumping	12807.70	.026	18271.67	.031	21938.51	.045	20123.24	.033
Comp. & Air Pipes	11502.62	.023	15295.71	.025	43234.07	.088	57536.41	.096
Back Filling	2009.30	.004	2128.55	.004	-	-	1.48	-
Underground Suptce.	53520.86	.108	59573.04	.099	321.44	.001	364.02	-
Comp. & Power Drills	1744.97	.003	2295.19	.004	23964.91	.049	23739.72	.039
Scrapers-Mech. Loaders	47522.75	.097	55097.01	.092	57215.20	.116	59914.72	.099
Tramming Equipment	31530.84	.064	35539.19	.059	25324.27	.051	21733.89	.036
Pumping Machinery	4006.47	.008	4340.29	.007	3014.14	.006	5417.22	.010
Total Undg. Costs	1092904.15	2.219	1272742.25	2.112	384974.74	.782	418496.16	.695
<u>Surface Costs</u>								
Hoisting	24477.66	.050	28099.04	.046	20685.27	.042	20881.69	.035
Stocking Ore	24671.89	.050	25791.10	.042	5696.92	.012	6763.45	.011
Screening-Crushing-Mine	48292.33	.098	48201.10	.080	16363.81	.033	15537.74	.026
Dry House	10084.37	.020	13007.83	.021	6217.17	.013	6031.86	.010
Gen. Surface Expense	18964.19	.039	22262.69	.037	2976.01	.006	12661.10	.021
Hoisting Equipment	8751.00	.018	11968.55	.019	7823.59	.016	8484.51	.014
Shaft	4432.35	.009	5504.37	.010	1290.60	.003	1234.10	.002
Top Tram Equipment	5774.79	.012	4106.76	.006	4928.81	.010	3662.72	.006
Docks, Trestles & Pckts.	10393.12	.021	4470.50	.008	5777.87	.012	4127.46	.007
Mine Buildings	9244.63	.019	10024.19	.017	27009.76	.055	7398.40	.012
Total Surface Costs	165086.33	.335	173436.13	.288	98769.81	.201	86783.03	.144
<u>General Mine Expenses</u>								
Geological	3227.31	.007	3076.99	.005	1628.10	.003	1064.69	.002
Mining Engineering	7155.67	.015	6322.77	.011	1618.09	.003	1374.73	.002
Mech. & Elec. Engr.	3695.80	.008	3102.30	.005	1373.40	.003	1014.22	.002
Analysis & Grading	21235.37	.043	26612.17	.044	13650.07	.028	3036.15	.005
Safety Department	3021.86	.006	3002.92	.005	1275.40	.003	992.00	.001
Tel. & Safety Devices	2590.96	.005	2534.72	.004	6710.28	.014	8058.62	.013
Local & Gen. Welfare	2073.64	.004	2807.07	.005	2971.41	.006	3331.55	.006
Spec. Exp. Pens. All.	1571.11	.003	1781.06	.003	910.84	.002	9641.93	.016
Ishpeming Office	18534.15	.038	21699.76	.036	9358.04	.019	18828.52	.031
Mine Office	27091.76	.055	28980.41	.048	7676.35	.016	569.07	-
Insurance	-	-	-	-	28626.79	.058	21561.99	.036
Personal Injury	1468.40	.003	1595.41	.002	29660.59	.060	33827.76	.056
Social Security Taxes	-	-	-	-	28848.83	.059	30532.92	.051
Employees Vacation Pay	57908.65	.118	57877.24	.096	-	-	-	-
Research Laboratory	92.59	-	-	-	109.95	-	-	-
Total Gen. Mine Exp.	149667.27	.304	159392.82	.265	134418.14	.273	138961.15	.231
Cost of Production	1407657.75	2.858	1605571.20	2.665	618162.69	1.255	644240.34	1.069
Taxes	-	-	-	-	156159.23	.317	196814.41	.327
Total Cost	1407657.75	2.858	1605571.20	2.665	774321.92	1.572	841054.75	1.396
	64.5%		65.6%		35.5%		34.4%	

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs: (Cont'd)

The cost of production increased \$0.38 per ton over 1948 costs. This, in spite of the fact, that we anticipated better efficiency in 1949 than 1948 because more contracts were equipped with the Carset bits. As mentioned in the introductory paragraphs of this report the explanation is in the human factor. Less attempt was made to keep production high by the individual miner even though he had better tools with which to do so. The supply cost could be expected to increase because prices were higher and the change in technique meant we had to purchase extra equipment. Supply costs increased .186 per ton over 1948 costs.

In general, the following cost analysis will deal only with those categories that show appreciable divergences in costs from the previous year.

Exploring in Mine

	<u>1949</u>	<u>1948</u>
Labor for Undg. Drilling	\$4,821.82	\$ 472.28
Prop. of D.D. Supt.'s Time	410.79	151.15
Bortz Loss	4,307.61	692.33
Pipe and Fittings	-	156.09
Drill Equipment & Repairs	-	33.38
Labor - Repairing	538.34	-
Purchase of New Drill	1,217.22	-
Miscellaneous Supplies	196.23	40.26
Compressor Expense	412.00	125.00
Credit on Bortz Bits	<u>3,648.43</u>	<u>508.70</u>
Total	<u>8,255.58</u>	<u>1,161.79</u>
Geological Expense for Drill	803.41	84.41
Analysis Expense	390.07	25.12
Auto Mileage Expense	-	7.75
Total Underground Drilling Cost	<u>9,449.06</u>	<u>1,279.07</u>
Geological Dept. Exp. for Mine Mapping	<u>4,855.41</u>	<u>4,141.68</u>
Total as Per Cost Sheet	<u>\$14,304.47</u>	<u>\$5,420.75</u>
Feet drilled underground with bortz	3,345	266
Cost Per Foot	2.824	4.809

During 1949 a total of 36 holes were drilled, most of them less than 100 feet in depth. Most of this work was done on the sub-levels above the 1st level in "B" Shaft. The project of searching for new ore closely adjacent to old workings has proved to be remarkably successful. It is obvious that the cost per ton in 1949 should be higher than in 1948 because the program was not started until late in 1948.

The cost figures shown above are all truly representative with the exception of the bortz charges. The salvage of bortz from used bits always occasions a delay in the credits accruing from such salvage. Therefore at any given moment we do not know what the adjustment amount may be.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs: (Cont'd)

Exploring in Mine: (Cont'd)

The table below gives the footage and percentage of each type of material drilled during 1948 and 1949:

	<u>1949</u>		<u>1948</u>	
Ore	716½'	21.4%	12'	4.5%
Lean Ore & 2nd Class Ore	634'	18.9%		
Conglomerate Ore	86'	2.6%	93'	35.0%
Hard Hematite Cherty Iron Form.	634'	19.0%	8'	3.0%
Intrusive	899½'	26.9%	153'	57.5%
Argillite	315'	9.4%		
Unoxidized Iron Formation	43'	1.3%		
Graywacke & Quartzite	17'	.5%		
Total	3,345'	100.0%	266'	100.0%

From discussions with the geological department personnel we believe that there is a good possibility that the surface exploratory program of drilling for Section 9 - 47 - 27 may be resumed in 1950. There is \$7,988.09 of unexpended balance in E. & A. account CC-93 which was originally set up for exploration for hard ore in Section 9 - 47 - 27. No work has been done on this project since 1943. Further delay is not justified because if there are hard ore deposits in Section 9, we must know about them long before they can be developed. This is especially true if they should happen to be much deeper than the bottom level of the Cliffs Shaft Mine.

Development in Rock

Comparative costs for the past five years are shown below:

Year	Footage	Labor Cost		Supply Cost		Total Cost	
		Total	Per Ft.	Total	Per Ft.	Total	Per Ft.
1945	1,969	36,203.46	18.39	8,663.01	4.40	44,866.47	22.79
1946	1,873	42,521.61	22.70	6,983.87	3.73	49,505.48	26.43
1947	3,221	65,283.16	20.27	16,902.58	5.25	82,185.74	25.51
1948	3,068	57,440.20	18.72	18,409.42	6.00	75,849.62	24.72
1949	2,498	53,452.09	21.40	15,162.05	6.07	68,614.14	27.47

The cost increased 2.68 per foot for labor. This is due to the fact that a much higher proportion of our development footage was in raises in 1949 compared to 1948. In the tables above and below, 1946 shows up as a comparable year with better than 1/3 of the footage in raise development. While we can use Carset bits for drilling in the raises there is as yet no alternative for the building of a stage to work from and the hand-held stoper as the drill machine. Therefore, raise costs are sometimes higher per foot than the much larger drifts where Jumbos and mechanical loaders reduce the labor time element.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs: (Cont'd)

Development in Rock: (Cont'd)

The table below shows footage in different categories for the last five years:

	1949	1948	1947	1946	1945
Rock Raises	787'	618'	665'	550'	493'
10' x 10' Main Haulage Drifts	1711'	2450'	2556'	1176'	1304'
8' x 8' Main Haulage Drifts	-	-	-	147'	172'
Total	2498'	3068'	3221'	1873'	1969'

The table following shows the kind of material in which the raises and drifts were developed. With the use of Carset bits this is of less importance because even in hard material the drilling cycle can be reduced to a point where it is a much smaller proportion of the complete cycle of operation.

	Jasper or Lean Ore	Siderite	Dike or Slate	Total
Rock Raises	215'	195'	377'	787'
10' x 10' Rock Drifts	294'	243'	1174'	1711'
8' x 8' Rock Drifts	-	-	-	-
Total	509'	438'	1551'	2498'

Development in Ore and Stopping

These two accounts are combined in this discussion because there is no accurate separation of costs into these two categories on the cost sheet.

Comparative costs for the last two years follows:

Year	Labor Cost	Supply Cost	Total Cost
1949	708,406.93	164,671.62	873,078.55
1948	822,177.50	181,736.73	1,003,914.23

The detailed cost for the two years are shown below:

	1949		1948	
	Total	Cost Per Ton	Total	Cost Per Ton
<u>Labor</u>				
Miner's Labor	368,962.83	.749	403,718.13	.670
Other Labor	339,444.10	.689	418,459.37	.694
Total	708,406.93	1.438	822,177.50	1.364

Supplies

General	5,431.31	.011	7,009.87	.012
Iron & Steel	47,407.68	.096	42,021.34	.070
Oils	1,262.11	.003	1,427.47	.002
Machinery	12,851.27	.026	19,123.75	.032
Explosives	73,611.05	.149	89,263.96	.148
Lumber	1,529.51	.003	2,192.67	.004
Electric Power	12,969.12	.026	10,562.03	.018
Sundries & Clearing Acc't.	1,234.28	.003	1,407.84	.002
Shop Expense Accounts	8,375.29	.017	8,727.80	.015
Total	164,671.62	.334	181,736.73	.302
Total Labor & Supplies	873,078.55	1.772	1,003,914.23	1.666

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs: (Cont'd)

Development in Ore and Stopping: (Cont'd)

Inasmuch as we instituted a new incentive pay system May 15, 1948 we could expect that 1949 would show a full year effect as compared to about a half-year effect in 1948. We expected miners pay to rise but other costs to drop because of added product. From the table it can be seen that the miners pay did rise and in this category, "other labor" decreased. The decrease however, did not offset the miner labor increase. In 1948 we had an average of 108.3 miners. In 1949 we had an average of 117 miners. Miner's helpers numbered 107 in 1948 and 110 in 1949. The increase in miners would raise the cost in that bracket and normally the number of miner's helpers should drop proportionately, if the contracts stay the same. We did have additional gangs in 1949 compared to 1948.

Supply items largely responsible for the \$.032 rise in supplies over 1948 were iron and steel and electricity. The change to a lighter steel section in conjunction with Carset bits caused that item to increase. Electricity costs rose because the price rose.

Pumping

Labor cost for pumping decreased \$.005 per ton compared to 1948, but supply costs rose \$.012 per ton for an overall increase of \$.007 per ton.

The average number of gallons of water pumped per minute for each month during the last five years is given in the table below:

<u>Month</u>	<u>1949</u>	<u>1948</u>	<u>1947</u>	<u>1946</u>	<u>1945</u>
January	691	717	723	785	826
February	692	701	762	750	804
March	726	696	739	744	808
April	720	724	679	786	913
May	828	720	830	766	835
June	892	692	874	783	907
July	956	758	888	787	909
August	1060	797	865	735	848
September	869	766	905	769	861
October	838	730	843	714	834
November	802	730	808	732	828
December	<u>784</u>	<u>699</u>	<u>798</u>	<u>664</u>	<u>799</u>
Avg. For Year	822	726	808	758	846

Compressors, Air Pipes & Power Drills

There was a slight reduction in this category from \$.121 per ton to \$.111 per ton. The reduction was due to the decrease in power consumption for compressing air. This saving was brought about by the use of smaller machines for drilling.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs: (Cont'd)

Maintenance of Compressors and Power Drills

The labor under this category has been small for the past three years. In 1947 it was .007 per ton, in 1948 it was .004 per ton and in 1949 it was .003 per ton. The bulk of the charges result from supplies which include supplies for the compressor repairs but mainly the new power drill equipment purchases. These were practically identical for 1948 and 1949 but the smaller tonnage in 1949 made the per ton cost rise from .039 to .049.

The table below shows the purchases of power drill equipment in the past five years. There are now two types of sinker which we are purchasing, namely - Ingersoll-Rand and Chicago Pneumatic 55 lb. class sinkers.

	<u>1949</u>	<u>1948</u>	<u>1947</u>	<u>1946</u>	<u>1945</u>
DA-35 Ingersoll-Rand Drifters	0	4	11	6	6
DA-35 Automatic Ingersoll-Rand Drifters	0	0	0	3	1
DA-30 " " " "	0	3	0	0	0
D-12 Cleveland Drifters	0	0	0	0	1
D-12 Automatic Cleveland Drifters	0	0	0	0	2
D-25 Cleveland Drifters	0	0	3	4	0
D-89 Gardner-Denver Drifters	0	1	3	1	1
D-89 Automatic Gardner-Denver Drifters	0	0	3	2	0
CF-79 " " " "	0	2	0	0	0
TM-300 Automatic Joy Drifters	0	2	0	0	0
Cleveland Stoper	0	0	1	0	0
IR-58 Ingersoll-Rand Stoper	0	0	3	5	0
IR-48 " " " "	0	2	0	0	0
HC-10-R LeRoi Reverse feed Stoper	1	1	0	0	0
JB-4 Ingersoll-Rand Jackhammers	0	14	15	0	0
J-10 " " " "	0	3	0	0	0
J-50 " " " "	27	7	0	0	0
H-111 LeRoi Sinkers	16	3	0	0	0
H-10 " " " "	0	1	0	0	0
LB-57 Joy Sinkers	0	1	0	0	0
S-55-W Gardner-Denver Sinkers	0	1	0	0	0
CP-59 Chicago-Pneumatic Sinkers	5	0	0	0	0
Total	<u>49</u>	<u>45</u>	<u>39</u>	<u>21</u>	<u>11</u>

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs: (Cont'd)

Scrapers & Mechanical Loaders

The cost increased .021 per ton over 1948 costs. Labor accounted for .005 of this increase and supplies for .016 of the increase. From the table below it can be seen that the 5/8" wire rope costs rose about .004 per ton. General electrical repairs and renewals rose about .02 per ton. We also had about .007 per ton higher cost because of purchase of loader motors and two 3-Drum Lund scraper hoists. The aggregate of these increases amounted to about .03 per ton but they were offset by about .01 per ton through lower costs of scraper blocks. This was brought about by the change to a Sullivan block which has given admirable service compared to the Lake Shore blocks.

	1949		1948	
	Amount	Cost	Amount	Cost
3/8" Wire Rope	625 ¹	62.50	1,065 ¹	90.95
1/2" Wire Rope	3,285 ¹	526.15	4,115 ¹	539.55
5/8" Wire Rope	95,715 ¹	19256.67	99,297 ¹	21563.67
No. 2 & 4 Electric Cable	5,317 ¹	4029.69	6,141 ¹	3912.43
Scraper Blocks	68	2868.54	230	8760.00
Gen. Electrical Reprs. & Renew.		74098.16		79515.11
Loader Motors	4	1569.10		-
3-Drum Lund Scraper Hoist	2	2327.14		-
Bal. on Sullivan Scraper Hoist		-		630.00
Total		104737.95		115011.71

The tonnage and unit cost for the past five years for 5/8" Wire Rope are compared below:

Year	Product	Type of 5/8" Rope Used	Purchased	Cost	Cost Per Ton	Feet Per Ton Ore
1945	550,169	"Trulay"	84,145 ¹	14,449.76	.0263	.153
1946	401,939	"	72,638 ¹	12,778.28	.0317	.180
1947	546,796	"	81,212 ¹	14,969.85	.0274	.149
1948	602,453	"	99,297 ¹	21,563.67	.0358	.165
1949	492,405	"	95,715 ¹	19,256.67	.0391	.194

Tramming Equipment

The cost per ton increased .02 in 1949 as compared to 1948. Of this amount, labor accounted for .005 per ton and supplies .015 per ton. We have tried in the past year to overhaul our haulage system and provide better trackage. This accounts for the general increase.

c. Comparative Mining Costs - Surface

Surface mining costs increased .104 per ton of which labor accounted for .047 per ton and supplies for .057 per ton. With the exception of one category "General Surface Expense" all the categories increased.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

8. COST OF OPERATING: (Cont'd)

c. Comparative Mining Costs - Surface: (Cont'd)

Hoisting, stocking ore and screening-crushing accounted for an increase of .044 per ton. Of this amount .03 per ton was a labor increase. These three functions require about the same amount of manpower regardless of the amount of ore handled. Therefore, with the smaller tonnage in 1949 it could be expected that the per ton cost would increase. The other principal increases were the result of increased costs in maintenance items dealing with docks, trestles, pockets and mine buildings. We built a new railroad loading pocket in 1949 which helped raise the cost in that category. Mine building costs would have been reasonable but for the necessary repair to "B" Shaft house. Shafthouse expense was approximately \$25,000.00 above normal because of these repairs. This raised the per ton cost .045 per ton.

9. EXPLORATIONS:

The following tabulation shows the diamond drill holes with level location, feet drilled and number of feet of ore encountered.

<u>Drill Hole Number</u>	<u>Level</u>	<u>Footage Drilled</u>	<u>Feet of Ore</u>
594	2nd "A"	10	-
595	2nd "A"	26	8½
596	2nd "A"	25	-
597	2nd "A"	42	14
598	2nd "A"	34	25
599	2nd "A"	11	8
600	2nd "A"	123	15
601	3rd "A"	35	-
602	4th "A"	14	-
603	4th "A"	113	20
604	10th "A"	35	-
605	3rd "A"	150	48
606	3rd "A"	61	-
607	3rd "A"	117	35
608	3rd "A"	30	6
609	2nd "A"	8	8
610	10th "A"	270	75
611	2nd "A"	55	46
612	2nd "A"	41	12
613	2nd "A"	19	8
614	2nd "A"	50	8
615	2nd "A"	31	10
616	2nd "A"	141	1
617	1st "A"	157	-
618	1st "A"	70	5
619	2nd "A"	92	12
620	1st "B"	84	2

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

9. EXPLORATIONS: (Cont'd)

<u>Drill Hole Number</u>	<u>Level</u>	<u>Footage Drilled</u>	<u>Feet of Ore</u>
621	Sub-1220 "B"	103	3
622	Sub-1220 "B"	211	35
623	Sub-1220 "B"	38	-
624	Sub-1220 "B"	111	85
625	Sub-1220 "B"	230	54
626	Sub-1220 "B"	114	60
627	Sub-1220 "B"	304	77
628	Sub-1220 "B"	360	36
629	Sub-1220 "B"	30	-
Total		3,345	716$\frac{1}{2}$ 21.4%

The table shows the worth of this project of testing the ribs, floors and sometimes backs of old workings. Ore left by the old operations is definitized as to location, extent and quality. In addition to this, new ore bodies are discovered as was the case on the 1220' sub-level, "B" Shaft.

10. TAXES:

Comparative data for 1949 and 1948 follows:

	<u>1 9 4 9</u>		<u>1 9 4 8</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
Realty	2,033,000	75,833.75	2,000,000	79,468.80
Minerals under NW $\frac{1}{4}$ of Sec. 9-47-27	-	-	80,000	3,178.75
Personal	916,100	34,171.81	846,100	33,619.28
Lot 2, Sec. 3-47-27 (Bancroft)	735,000	27,416.53	785,000	31,191.50
SE $\frac{1}{4}$ of NE $\frac{1}{4}$ of Sec. 9-47-27 (Barnum)	-	-	57,000	2,264.86
Lot 174, Nelson's Addition	100	3.73	100	3.97
South 35.91 ft. of Lot 179	50	1.87	50	1.99
S $\frac{1}{2}$ of NW $\frac{1}{4}$ of Sec. 10-47-27	<u>1,100,000</u>	<u>41,031.54</u>	<u>1,185,000</u>	<u>47,085.26</u>
Total	4,784,250	178,459.23	4,953,250	196,814.41
Taxes per ton produced		.3614		.3267
Taxes per ton shipped		.3499		.3292

Valuations and taxes for the past ten years are shown below:

<u>Year</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Tax Rate</u>
1949	178,459.23	4,784,250	37.3014
1948	196,814.41	4,953,250	39.7344
1947	181,298.27	5,063,250	35.8067
1946	175,372.16	4,883,250	35.9130
1945	178,544.98	4,968,250	35.9372
1944	159,909.45	4,443,250	35.9893
1943	146,539.81	4,268,250	33.9926
1942	143,225.85	4,093,250	34.6443
1941	144,195.60	4,042,150	35.3198
1940	137,284.25	3,982,150	34.4748

Valuations decreased \$169,000.00 and taxes decreased \$18,355.18.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

10. TAXES: (Cont'd)

City of Ishpeming Tax Levy

Valuation	<u>1 9 4 9</u>		<u>1 9 4 8</u>	
	<u>Amount</u>	<u>Rate</u>	<u>Amount</u>	<u>Rate</u>
Valuation	17,622,500.00		13,361,175.00	
<u>Tax Levy by Funds</u>				
County Tax	118,070.75	6.7	110,229.69	8.25
County Road Tax	29,077.13	1.65	22,045.94	1.65
School Tax	167,413.75	9.5	121,586.69	9.1
School Debt Serv. Tax	9,387.50	.5328	9,812.50	.7344
Gen'l Optg. Debt Serv.	210,480.52	11.9439	200,417.63	15.00
Capital Improvement	<u>122,914.48</u>	<u>6.9747</u>	<u>66,805.87</u>	<u>5.00</u>
Total Taxes	657,344.13	37.3014	530,898.32	39.7344

11. ACCIDENTS AND
PERSONAL INJURY:

The accident record for the year is shown below:

	<u>Cliffs Shaft Mine</u>	<u>C. C. I. Co.</u> <u>Undg. Mines</u>	<u>C. C. I. Co.</u> <u>All Operations</u>
Tons of Ore Mined	492,405	4,182,479	7,162,324
Hours of Labor	891,564½	5,408,422¾	8,107,935½
No. of Fatalities	0	1	1
No. of Compensable Accidents	12	110	126
No. of Non- " "	25	205	229
Total Lost Time Accidents	37	316	356
No Lost Time Accidents	73	723	1035
Days Lost, Compensable Injuries	263	4488	5273
Days Lost, Non- " "	63	495	560
Total Days Lost	326	10983	11833
Frequency Rate	41.50	58.43	43.91
Severity Rate	.366	2.031	1.459

Frequency Rate - Number of accidents for every 1,000,000 man hours.
Fatalities 6,000 days.

Severity Rate - Number of days lost per 1,000 man hours.

12. NEW CONSTRUCTION
ORE EQUIPMENT:

The following E. & A.'s were continued from 1948 or authorized during 1949:

E. & A. No. CC-150

This E. & A. was for the purchase and installation of a fan to provide forced ventilation in the Cliffs Shaft Mine. The fan was installed in 1948 but the E. & A. has not been closed because there is still some work to be done on the directing of air flow. There is an unexpended balance of \$3,142.07 in this E. & A.

E. & A. No. CC-302

This covers the purchase of 20 sinker-type machines and 20 Jacklegs to be used in conjunction with Carset bits in a new drilling technique. Total expended was \$9,069.67.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

12. NEW CONSTRUCTION
ORE EQUIPMENT: (Cont'd)

E. & A. No. CC-305

This E. & A. was for the repair of the Engine House roof and replacement of the old Boiler House roof. Total authorized was \$8,725.00. By the end of the year \$4,926.48 had been expended. The work will be finished in spring of 1950.

E. & A. No. CC-314

This E. & A. was for \$2,700.00 for the purchase of a new Ford dump truck less allowance of \$250.00 for old truck. Total cost was \$2,568.90.

E. & A. No. CC-316

This E. & A. for \$33,000.00 was to cover the cost of repairing "A" and "B" concrete shafthouses. "B" Shafthouse was repaired in 1949 at a cost of \$21,141.34. Work on "A" Shaft will have to be deferred until the weather permits such repair in 1950.

E. & A. No. CC-335

The amount authorized was \$22,300.00 to cover the cost of replacing timber sets by steel through the section of "A" Shaft from ledge to the collar. Material was ordered for this job but will not be delivered until April, 1950.

E. & A. No. CC-338

By the end of 1949, E. & A. CC-338 had been expended except for \$419.30 out of a total of \$9,200.00 authorized for purchase of 20 additional sinkers and 20 jacklegs.

14. MAINTENANCE
AND REPAIRS:

Dwellings

	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
Hard Ore Location	\$1,506.60	\$1,072.39	\$ 2,578.99
Barnum Location	493.71	418.73	912.44
Outhwaite Purchase	999.63	991.64	1,991.27
Hyde Purchase No. 1	711.04	1,001.24	1,712.28
Hyde Purchase No. 2	1,336.75	1,041.23	2,377.98
Smith Purchase	952.66	545.36	1,498.02
Berg Purchase	1,241.07	1,136.90	2,377.97
Ramsdell Purchase	1,156.55	1,035.51	2,192.06
Nelson Purchase	-	5.68	5.68
Second Addition	-	362.95	362.95
Grand Total	\$8,398.01	\$7,611.63	\$16,009.64

Comparative figures for the past six years follows:

Total for Year 1949	-	\$16,009.64
1948	-	11,392.18
1947	-	18,505.26
1946	-	8,559.19
1945	-	10,772.98
1944	-	12,771.58

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1949

15. POWER:

The following five year comparison shows power consumption, cost and rate per K.W.H.:

<u>Year</u>	<u>K. W. H.</u>	<u>Cost</u>	<u>Rate per K.W.H.</u>
1949	6,890,166	107479.26	.015375
1948	8,422,715	117605.65	.013964
1947	8,119,492	113591.74	.013988
1946	5,824,429	83288.58	.014299
1945	7,097,196	102385.23	.014426

The detail of distribution of power at the mine follows:

	<u>K. W. H.</u>	<u>Cost</u>
Scraping Ore & Rock	807,570	13,915.90
Pumping	1,317,612	20,519.10
Hoisting	1,147,971	17,789.46
Stocking Ore	21,160	327.81
Crushing Ore	237,800	3,339.17
Dry House Expense	58,936	953.74
Surface	41,766	648.26
Telephone & Safety Expense	93,384	1,552.98
Mine Office	9,448	163.67
Machine & Carpenter Shop	4,985	65.93
Drill & Jackbit Shop	43,156	658.77
Heating Plant	12,380	193.89
Compressors	2,458,198	37,511.85
Electric Haulage	607,800	9,438.70
Ventilation	28,000	400.03
Total	<u>6,890,166</u>	<u>107,479.26</u>

Comparative data for 1949 and 1948 follows:

	<u>1949</u>	<u>1948</u>	<u>Difference</u>	<u>Inc.%</u>	<u>Dec.%</u>
Production - Tons	492,405	602,453	110,048		18.34
	<u>K.W.H.</u>	<u>K.W.H.</u>			
Scraping Ore & Rock	807,570	809,830	2,260		2.79
Pumping	1,317,612	1,303,352	14,260	1.09	
Hoisting	1,147,971	1,313,209	165,238		12.58
Stocking Ore	21,160	12,931	8,229	63.63	
Crushing Ore	237,800	236,964	836	.35	
Dry House Expense	58,936	74,280	15,344		20.65
Surface	41,766	48,019	6,253		13.02
Telephone & Safety Devices	93,384	103,111	9,727		9.43
Mine Office	9,448	12,529	3,081		24.59
Machine & Carpenter Shop	4,985	3,788	1,197	31.5	
Drill & Jackbit Shop	43,156	56,962	13,806		24.24
Heating Plant	12,380	14,419	2,039		14.14
Compressors	2,458,198	3,732,487	1,274,289		34.12
Electric Haulage	607,800	677,362	69,562		10.27
Ventilation	28,000	23,472	4,528	19.29	
Total	<u>6,890,166</u>	<u>8,422,715</u>	<u>1,590,648</u>		<u>18.89</u>

LLOYD MINE
ANNUAL REPORT
YEAR 1949

1. GENERAL

The production was 207,954 tons compared with 98,284 tons in 1948 when operations were confined chiefly on development of the 9th Level. All the product was obtained from the new level which was brought into production late in the previous year following depletion of the reserves above the 8th Level. As the new level was being developed for maximum production the labor force was increased 9½% compared with the size of the crew at the beginning of the year. A working schedule of three eight-hour shifts, six days per week was in effect until June 27th and then the schedule was reduced to three eight-hour shifts, five days per week.

The total shipments decreased and the bulk of the tonnage or approximately 85% was Lloydale grade. There was a large drop in the shipments of Silica grade and the tonnage represents only 20% of the amount shipped in the previous year. The Lloydale grade in stock was nearly all loaded out in mid-summer but the sharp curtailment in shipments during the balance of the season and the industry-wide strike in the fourth quarter resulted in a larger inventory of ore on hand than at the end of the previous year. The stockpile inventory at the close of the year showed 38,134 tons of Lloydale grade and 49,016 tons of Silica grade.

The two small orebodies above the 9th Level were fully developed for mining during the year with sub caving operations being conducted in the main deposit and the sulphurous deposit was developed primarily for sub level stoping. The small size of each of the deposits severely limits the number of contracts that can be employed making it advisable to concentrate all mining operations on a three eight-hour shift basis to realize the best efficiency. The initial development in the sulphurous deposit indicated a much higher sulphur content in the ore than was proven by subsequent mining and the mixed product from both deposits averaged much lower in sulphur than anticipated before mining was started.

On October 1st at 12:01 A.M. the Union called an industry-wide strike in support of their demands for increased retirement and health and insurance benefits. Operations were resumed on November 14th following settlement of the strike which caused employees a loss of 30 working days. The Union maintained pickets on duty during the strike period but unlike the previous strike there was no violence or demonstrations and interference with the maintenance men reporting to work. In addition to the six regular holidays that were observed during the year a one-week vacation was allowed employees during the week of August 15th and there was no production during this period.

2. PRODUCTION, SHIPMENTS AND INVENTORIES

a. Production by Grades

<u>Grade</u>	<u>Tons</u>	<u>Percent</u>
Lloydale	143,512	69
Lloyd Silica	64,442	31
	<u>207,954</u>	<u>100</u>

Operations during the year were based on a 70% Lloydale and 30% Silica grade proportion and in the coming year approximately the same ratio will be maintained.

LLOYD MINE
ANNUAL REPORT
YEAR 1949

2. PRODUCTION, SHIPMENTS AND INVENTORIES (Cont'd)

b. Shipments

Total shipments were less than last year due to the decreased demand for ore in the second half of the year and the strike. A sharp drop occurred in the Silica grade shipments due to the small tonnage of this grade mixed in the Cliffs Group cargoes compared with other years. There was no stockpile overrun realized because the stockpiles of both grades were not loaded out.

The following table shows the shipments during the past six years:

<u>Year</u>	<u>Lloyddale</u>	<u>Silica</u>	<u>Total</u>
1944	260,472	16,577	277,049
1945	238,045	101,423	339,468
1946	182,664	17,711	200,375
1947	145,480	272,632	418,112
1948	55,767	108,388	164,155
1949	127,384	21,586	148,970

c. Stockpile Inventories

<u>Grade</u>	<u>Tons</u>
Lloyddale	38,134
Lloyd Silica	49,016
Total	87,150

The tonnage on hand at the end of the year is larger than a year ago and the Silica grade again represents the bulk of the inventory.

d. Division of Product by Levels

There was no production above the 8th Level because the reserves above this elevation were depleted in 1948. The product in 1950 will again be obtained entirely from the 9th Level

e. Production by Months

<u>Month</u>	<u>Days</u>	<u>Lloyddale Ore Tons</u>	<u>Lloyd Silica Ore Tons</u>	<u>Total Ore Tons</u>	<u>Rock Tons</u>	<u>Tons Per Man Per Day</u>
January	25	13,569	6,050	19,619	24	5.82
February	24	10,005	7,642	17,647	182	5.49
March	27	18,413	9,821	28,234	72	7.53
April	26	12,246	8,372	20,618	221	5.94
May	26	15,178	5,281	20,459	235	5.94
June	26	17,209	3,442	20,651	136	5.93
July	18	10,094	4,555	14,649	55	5.16
August	18	11,711	3,615	15,326	109	5.34
September	21	15,623	2,959	18,582	8	5.95
October	-	-	-	-	-	-
November	12	6,740	3,783	10,523	84	6.50
December	21	12,650	8,922	21,572	81	6.77
Total	244	143,512	64,442	207,954	1,207	6.05
Transfers		-	-	-	-	-
Current Year Stockpile		143,512	64,442	207,954	1,207	6.05
Overrun		-	-	-	-	-
Grand Total		143,512	64,442	207,954	1,207	6.05

LLOYD MINE
ANNUAL REPORT
YEAR 1949

2. PRODUCTION, SHIPMENTS AND INVENTORIES (Cont'd)

f. Ore Statement

	<u>Lloydale</u>	<u>Lloyd Silica</u>	<u>Total</u>	<u>Total</u>
	<u>Tons</u>	<u>Tons</u>	<u>Tons</u>	<u>Last</u>
				<u>Year</u>
On Hand January 1, 1949	22,006	6,160	28,166	94,037
Output for Year	143,512	64,442	207,954	98,266
Transfers	-	-		
Overruns	-	-	-	18
Total	165,518	70,602	236,120	192,321
Shipments	127,384	21,586	148,970	164,155
Balance on Hand	38,134	49,016	87,150	28,166
Increase in Output			109,670	
Decrease in Shipments			15,185	
Increase in Ore on Hand			58,984	

The operating schedule for the past five years follows:

- 1945 - 2-8 hr. shifts hoisting and 3-8 hr. shifts mining, 5 days per week, January 1 to January 27. Effective January 27, 2-8 hr. shifts hoisting and 3-8 hr. shifts mining, 6 days per week to December 31, 1945.
- 1946 - 2-8 hr. shifts per day hoisting and 3-8 hr. shifts per day mining, 6 days per week.
- 1947 - Hoisting operations 2-8 hr. shifts per day, 6 days per week and mining 3-8 hr. shifts per day 6 days per week, January 1 to March. Effective March 1, hoisting and mining operations 2-8 hr. shifts per day, 6 days per week.
- 1948 - Hoisting operations 2-8 hr. shifts and mining 3-8 hr. shifts, 6 days per week, January 1 to November 29. Effective November 29, hoisting and mining 3-8 hr. shifts, 6 days per week.
- 1949 - Hoisting and mining operations 3-8 hr. shifts per day, 6 days per week, January 1 to June 27. Effective June 27 hoisting and mining 3-8 hr. shifts, 5 days per week.

g. Delays

There were four delays to operations that caused a substantial loss in production and they are listed below in the order of their occurrence.

During the afternoon shift on April 4th one of the main bearings on the drum shaft of the auxiliary winze hoist broke causing a 41 hour delay to hoisting and mining before repairs were completed. A temporary repair was made on the bearing so the hoist could be used while a new one was being machined. The estimated loss in production on account of this delay was 1700 tons.

LLOYD MINE
ANNUAL REPORT
YEAR 1949

2. PRODUCTION, SHIPMENTS AND INVENTORIES (Cont'd)

g. Delays (Cont'd)

On the afternoon shift on May 24th the same bearing on the drum shaft of the auxiliary hoist broke again causing a 21 hour delay to hoisting and mining before repairs could be completed. A temporary repair was again made so that operations could be resumed while a new bearing was being prepared. The new bearing was installed the first week in June and there was no further trouble from this source for the balance of the year. The delay caused an estimated loss in production of 725 tons.

On the midnight shift July 14th the engineer operating the winze hoist raised the cage with a loaded car on it against the head sheave causing the rope to break and the cage to drop to the bottom of the winze. The cage was damaged beyond repair and it was necessary to install a spare cage and sheave and also a new rope before operations could be resumed. A 24 hour delay to hoisting was caused by this breakdown and there was an estimated loss of 800 tons in production.

In the late afternoon on July 28th a washout of the fill around the collar of the shaft occurred during a heavy rainfall. About 40 yds. of saturated gravel and sand around the shaft timber broke through the casing about 30' below the collar and partially filled the bottom of the shaft at the skip pit level. The shaft timber was not shifted or damaged although two concrete abutments that support the head frame steel settled with the caving material. To renew the support for the shaft steel 30 yds. of concrete were poured around the shaft timber and the balance of the washout was filled with mine rock. The clean-up work at the bottom of the shaft was done during the weekend period so that operations could be resumed on Monday, August 1st. A 32 hour delay to hoisting was caused by the damage to the shaft and there was an estimated loss of 1200 tons in production.

3. ANALYSIS

a. Average Mine Analysis on Output

	<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
	Lloyddale	143,512	58.82	.145	8.84
	Lloyd Silica	64,442	52.72	.134	17.21

✓ 207,954

b. Analysis of Ore in Stock December 31, 1949

	<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
	Lloyddale Dried	38,134	58.85	.132	9.43	.20	2.50	.73	.55	.061	2.99	
	Lloyddale Nat'l.		51.09	.115	8.19	.17	2.17	.63	.48	.053	2.60	13.18
	Lloyd Sil. Dried	49,016	52.61	.133	17.55	.22	2.90	.50	.67	.034	3.07	
	Lloyd Sil. Nat'l.		45.87	.116	15.30	.19	2.53	.44	.58	.030	2.68	12.81

LLOYD MINE
ANNUAL REPORT
YEAR 1949

3. ANALYSIS (Cont'd)

c. Complete Analysis of Ores Shipped

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Lloyddale	127,384	59.00	.162	8.20	.20	2.50	.72	.55	.044	3.00
Lloyd Silica	21,586	52.30	.132	17.38	.22	2.90	.50	.67	.015	3.07

d. Complete Analysis of Straight Cargoes

There were no straight cargo shipments.

4. ESTIMATE OF ORE RESERVES

a. Developed Ore

The following is an estimate of ore reserves as of December 31, 1949 using a factor of 12 cubic feet per ton.

	<u>Standard Ore</u>	<u>Sulphurous Ore</u>	<u>Total Tons</u>
	<u>No. 1 Deposit</u>	<u>No. 2 Deposit</u>	
Between 8th and 9th Levels	215,725	197,634	413,359
Total Gross as of Oct. 1, 1949	215,725	197,634	413,359
Less Oct. 1 - Dec. 31, 1949 Production	7,786	11,678	19,464
Total Gross as of Dec. 31, 1949	207,939	185,956	393,895
Less 10% for Mining and Rock	21,573	19,763	41,336
Net Total as of Dec. 31, 1949	186,366	166,193	352,559

The following table shows a comparison of developed ore during the past three years.

	<u>1947</u>	<u>1948</u>	<u>1949</u>
Reserves on January 1	354,156	341,211	533,848
Production	131,354	72,071	143,512
Balance	222,802	269,140	390,336
Reserves on December 31	341,211	533,848	352,559
New Ore Developed	118,409	264,708	37,777

There is a substantial reduction in the estimated reserves due to the fact that no new ore extensions were proven by either the mining or development in both deposits. The No. 1 Deposit is well delineated by both the mining and development and there is no possibility of proving new ore in this deposit between the 8th and 9th Levels. Mining and development in the No. 2 or sulphurous deposit has proven a continuation of a very narrow orebody from the 8th to 9th Levels and near the center the ore area is further reduced by a dike that cuts diagonally through the orebody. Another disappointing development in this deposit is the fact that exploration at the 9th Level elevation has failed to prove much ore adjacent to the diabase dike. It is now definitely known that concentration is limited entirely to a narrow width along the slate footwall side forming a crescent shaped deposit which does not widen appreciably even at the 9th Level elevation.

LLOYD MINE
ANNUAL REPORT
YEAR 1949

4. ESTIMATE OF ORE RESERVES (Cont'd)

a. Developed Ore (Cont'd)

The small remaining reserves indicates two more years of operating life. The only possible hope of extending the life beyond this time lies in exploring the relatively large unknown area to the south of the present orebodies and at a considerably lower depth that any exploration has reached to date.

b. Estimated Analysis of Ore Reserves

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Lloyddale Dried	58.70	.150	8.75	.23	2.70	.86	.57	.070	3.57	
Lloyddale Nat'l.	51.36	.131	7.66	.20	2.36	.75	.50	.061	3.12	12.50

5. LABOR AND WAGES

a. General

Employee membership in the Union dropped slightly to 95.6% compared with 100% in the previous year. The difference is due to a relatively large turnover in the labor force while building it to the desired strength. Employee relations have been maintained on a satisfactory basis despite the Union strength and evidence of this is again reflected in the very small number of complaints that have been brought up during the year. The complaints were minor in nature and were settled in Step 1 of the grievance procedure.

The attitude of the employees during the strike was considerably different than during the strike in 1946. Picketing was conducted in a very peaceful manner and there appeared to be very little enthusiasm on their part to support the Union demands which caused the strike, and consequently they seemed to grudgingly accept the position the Union had taken. The strike was settled on the basis of the industry-wide settlement granting a maximum pension of \$100.00 a month including social security for employees 65 years of age with 25 years of service. Increased health and insurance benefits are also part of the basis for settlement of the strike.

The labor turnover was quite large in the process of building up the crew to the desired size. The number of men on the payroll at the end of the year was 150 compared with 137 a year ago. There were 10 men transferred to other mines, 4 laid off, 3 quit, 3 were retired and 1 died. A total of 17 men were hired and 17 were transferred from other mines making a net increase of 13 men on the labor force.

b. Comparative Statement of Wages & Product

<u>Product</u>	<u>1 9 4 9</u>	<u>1 9 4 8</u>	<u>Incr.</u>	<u>Decr.</u>
	207,954	98,284	109,670	
<u>No. of Shifts & Hours</u>				
Jan. 1 to June 27		3-8 Hr. Hoisting (6 Days Per Week)		
		3-8 Hr. Mining (6 Days Per Week)		
June 27 through Dec. 31		3-8 Hr. Hoisting (5 Days Per Week)		
		3-8 Hr. Mining (5 Days Per Week)		

LLOYD MINE
ANNUAL REPORT
YEAR 1949

5. LABOR AND WAGES (Cont'd)

b. Comparative Statement of Wages & Product (Cont'd)

<u>Average Number of Men Working</u>	<u>1 9 4 9</u>	<u>1 9 4 8</u>	<u>Incr.</u>	<u>Decr.</u>
Surface	38	31 $\frac{1}{4}$	6 $\frac{3}{4}$	
Underground	102 $\frac{3}{4}$	52	50 $\frac{3}{4}$	
Total	140 $\frac{3}{4}$	83 $\frac{1}{4}$	57 $\frac{3}{4}$	

<u>Average Wages Per Day</u>				
Surface	11.62	11.09	.53	
Underground	12.79	13.02		.23
Total	12.47	12.30	.17	

The following table shows a comparison of the average wages per day for surface and underground for the past five years:

<u>Year</u>	<u>Surface</u>	<u>Underground</u>
1945	7.63	8.86
1946	9.31	10.46
1947	10.32	11.86
1948	11.09	13.02
1949	11.62	12.79

<u>Wages Per Month of 24 Days</u>	<u>1 9 4 9</u>	<u>1 9 4 8</u>	<u>Incr.</u>	<u>Decr.</u>
Surface	278.88	266.16	12.72	
Underground	306.96	312.48		5.52
Total	299.28	295.20	4.08	

<u>Wages Per Month of 22 Days</u>				
Surface	255.64	243.98	11.66	
Underground	281.38	286.44		5.06
Total	274.34	270.60	3.74	

<u>Product Per Man Per Day</u>				
Surface	22.40	10.47	11.93	
Underground	8.29	6.27	2.02	
Total	6.05	3.92	2.13	

<u>Labor Cost Per Ton</u>				
Surface	.518	1.059		.541
Underground	1.543	2.075		.532
Total	2.061	3.134		1.073

<u>Average Product Stopping</u>	29.44	26.25	3.19	
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<u>Average Wages Contract Miners</u>	13.76	13.76?	13.75	
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<u>Total Number of Days</u>				
Surface	9,283	9,385 $\frac{1}{2}$		102 $\frac{1}{2}$
Underground	25,085 $\frac{1}{2}$	15,664 $\frac{1}{4}$	9,421 $\frac{1}{4}$	
Total	34,368 $\frac{1}{2}$	25,049 $\frac{3}{4}$	9,318 $\frac{3}{4}$	

LLOYD MINE
ANNUAL REPORT
YEAR 1949

5. LABOR AND WAGES (Cont'd)

b. Comparative Statement of Wages & Product (Cont'd)

<u>Amount of Labor</u>	<u>1 9 4 9</u>	<u>1 9 4 8</u>	<u>Incr.</u>	<u>Decr.</u>
Surface	107,808.27	104,110.01	3,698.26	
Underground	320,810.90	203,970.72	116,840.18	
Total	428,619.17	308,080.73	120,538.44	

Proportion of Surface to Underground Men

1945 - 1 to 2.88
 1946 - 1 to 3.59
 1947 - 1 to 2.80
 1948 - 1 to 1.67
 1949 - 1 to 2.70

6. SURFACE

a. Buildings

There were no new buildings constructed and very little repairs were required to maintain the existing buildings in good condition.

A small sheet metal frame addition was erected on the top landing on the east side of the shaft house for use as a storage shed for supplies.

The large set of doors on the east wall of the enginehouse were repaired and weather-stripped to reduce the heat loss through the doors during the cold weather.

The walls in the clean clothes room in the dry house were washed and painted and also the Captain's and shift bosses' shower and change room. The walls and ceiling in the office rooms were washed and some interior painting was done. The shower room in the change room for the shop employees was also cleaned and given a coat of paint.

b. Stocking Grounds

Stockpile loading was confined mostly to Lloydale grade although the pile of this grade in the area to the east of the shaft was not all loaded out. Most of the Silica grade shipments was made from the pile of this grade also in the area east of the shaft and only a relatively small tonnage was loaded out leaving the bulk of the inventory of this grade in this area. A relatively small tonnage of Silica grade remains in stockpile to the north and also west of the shaft and no loading was done from the latter area in 1949.

At the close of the shipping season 17 bents of trestle were erected to re-establish the trestle in the north half of the area east of the shaft. Due to the decline in the productive capacity of the mine the latter area has provided ample stocking capacity for both grades for several years.

LLOYD MINE
ANNUAL REPORT
YEAR 1949

6. SURFACE (Cont'd)

b. Stocking Grounds (Cont'd)

All the stockpile loading was done with the Bucyrus 54B electric shovel and due to the mobility of this shovel loading from the various piles can be accomplished with less delay and more economy.

Some major repairs were made to the rock trestle to the south of the shaft when settling of the pile into the adjacent cave also caused settlement of trestle. A portion of the pile was bull-dozed into the cave and three bents that had settled badly were re-erected.

c. Roads

The road leading to Section 6 Shaft was cleared of small trees and shrubbery and graded with the bull-dozer preliminary to starting a major repair job in the ladder compartment of Section 6 Shaft. Heavy rains during the summer months washed out a lot of fill in a section of the main road leading to the mine and this section was back-filled with mine rock. There were no new roads constructed around the surface plant.

7. UNDERGROUND

a. Shaft Sinking

There was no shaft sinking done in 1949.

b. Development

The development was confined to areas above the 9th Level and nearly all of it was in ore. There were no extensions driven on the main level - the work was concentrated entirely on the development of sub level stopes and caving areas.

Five caving areas were developed in the main orebody, three from raises above the east crosscut and two from raises above the west crosscut. The first sub was developed 50' below the 8th Level and a pillar of the same height caved to recover ore to the old 8th Level elevation and in several cases small pillars above the level. The development in each area comprised driving scraping drifts along the strike of the orebody to the limits of the pillar that was caved and putting up numerous mills to a height of 20' above the scraping drift where a small drift was advanced to connect the mills. In the west half of the orebody two caving areas were developed from No. 910A and 910B Raises on the 145' Sub. Parallel scraping drifts were advanced to the east of the raises for a distance of 150' and the pillar of ore above the drift was developed for caving by putting up a number of mills on each side of the scraping drift and connecting them at an elevation of 20' above the drift. Scraping drifts were also advanced to the west of the raises to the ore limits which were encountered 100' southwest of No. 910B Raise and at the furthest point 150' west of No. 910A Raise. Due to more favorable width of ore at this end of the orebody two scraping drifts were advanced from No. 910A Raise to the ore limits to enable caving an area the full width of the orebody. Numerous mills were put up from each of the scraping drifts and connected in the usual manner by a small drift 20' above the scraping sub.

LLOYD MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND (Cont'd)

b. Development (Cont'd)

In the east half of the orebody two caving areas were developed in addition to the first one at the extreme east end that was developed for mining at the close of the previous year. In the latter area development consisted of putting up additional mills from the scraping drift east of the raise and connecting them at an elevation of 20' above the drift as caving operations retreated towards the raise. Directly west of this area mining was underway in a caving area at the close of the year above the scraping drift that was driven to the east from No. 921 Raise. Four mills had been completed above the scraping drift and connected 20' above the transfer. Late in the previous year a pillar west of No. 921 Raise had been developed for caving and as mining retreated east towards the raise additional mills were put up on both sides and connected at the usual height above the transfer. At the east end of the deposit on the \swarrow 120' Sub a small amount of development was driven upon completing the mining in this area on the \swarrow 145' Sub Level. A drift was advanced 65' to the east from No. 922 Raise in the narrow crotch of ore between the dike and the slate footwall for the purpose of draining a large amount of water from adjacent mining areas. A small drift 90' in length was also advanced to the west of the raise to connect with No. 921 Raise for ventilation and travelling purposes.

In the sulphurous deposit the development was primarily for sub level stopes, one at each end and a third in the center of the deposit. A major part of the development for each of the stopes was driven in the previous year and mining was underway in the most easterly stope at the end of 1948. Additional development was driven for the central and west stopes as mining progressed and it consisted of putting up additional mills above the transfer for drawing ore as the stopes were enlarged. At the west end of the orebody a mill was put up to the jasper hanging 100' above the transfer and intermediate sub drifts were driven to connect with existing development for the west stope.

After mining in the east stope was interrupted by caving a sub level caving method was substituted in this area. No. 928 Raise was put up from the east crosscut 116' in ore and two scraping drifts were advanced radiating in a north-easterly direction on the \swarrow 145' Sub and sub caving operations developed adjacent to the old stope. Both drifts were advanced about 90' in ore and mill raises put up and connected a short distance above the transfer to complete the development. On the \swarrow 45' Sub Level a transfer drift was cut out above the east crosscut and advanced 175' to the southwest. The drift was advanced about 60' in jasper hanging and proved only a small amount of ore before encountering the dike that cuts diagonally through the sulphurous deposit. A branch drift was also cut out late in the year over the west crosscut and will be advanced to connect with this development for the purpose of exploring and developing the central part of the deposit adjacent to the diabase dike.

LLOYD MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND (Cont'd)

c. Stoping

Caving and stoping methods have continued to be employed exclusively, the main orebody being developed entirely for caving and the sulphurous deposit for both methods of mining. A 50' sub interval is employed in the caving operations and the first sub above the 9th Level was developed to recover ore to the old workings at the 8th Level elevation. The production from the sulphurous deposit has been mainly from sub level stopes with one caving area being employed at the east end. The ore in this area caved too readily for a good stope operation and a caving method was substituted early in the year.

Mining was conducted on seven sub levels ranging from the 8th Level down to the \nearrow 45' Sub Level which is a short distance above the 9th Level. There were eight contracts employed at the end of the year and during the year an average of six were engaged in mining and two on development work.

The following is a detailed description of the mining on the various sub levels:

8th Level

Four contracts conducted caving operations in the main orebody and recovered ore at the 8th Level elevation extending from the east to the west limits of the orebody. At the east end an area 120' x 60' was mined by caving operations conducted from a scraping drift to the east of No. 922 Raise on the \nearrow 145' Sub Level. Directly to the west of this area a pillar was being recovered by caving operations being conducted from a scraping drift to the east of No. 921 Raise on the \nearrow 145' Sub Level. An area 50' x 40' was mined at the close of the year representing about one-third of the pillar that is being mined. In the central part of the orebody an area 250' x 50' was mined by two contracts conducting caving operations from scraping drifts on the \nearrow 145' Sub. At the west end of the orebody two irregular shaped areas were also mined by caving operations, one along the north footwall side and the other along the diabase dike. In December caving operations were still underway in this area recovering the remaining pillar along the north footwall side.

In the sulphurous deposit two separate areas were mined by stoping operations that induced a cave extending to this elevation. At the east end an area 90' x 35' was mined and at the west end an area 115' x 20' was recovered.

Subs above the 9th Level

\nearrow 170' Sub Level

Three separate areas were mined by caving on this sub in the main orebody. At the east end an area 120' x 50' was mined above the scraping drift to the east of No. 922 Raise on the \nearrow 145' Sub Level. Mining was underway in a pillar directly west of this area in December and an area 40' x 40' had been mined. In the central part of the orebody an area 250' x 60' was mined by two caving operations conducted above scraping drifts that were driven on the \nearrow 145' Sub Level. At the west end of the deposit an area 90' x 130' was mined by two adjacent caving operations that were conducted from scraping drifts to the west of No. 910A and 910B Raises on the \nearrow 145' Sub Level.

182

LLOYD MINE
ANNUAL REPORT
YEAR 1949

7. UNDERGROUND (Cont'd)

c. Stoping (Cont'd)

Subs above the 9th Level (Cont'd)

✓ 170' Sub Level (Cont'd)

Two separate areas were also mined in the sulphurous deposit on this sub, one at the east and the other at the west end of the orebody. At the east end an area 100' x 35' was mined by stoping operations early in the year. When caving on a large scale made it necessary to abandon stope operations a sub caving method was substituted and development was completed to this elevation so that recovery of the remaining ore on the west side of the old stope could be started. At the west end of the orebody an area 110' x 20' was recovered by stope operations.

✓ 145' Sub Level

The scraping drifts for each of the caving areas in the main orebody were driven on this elevation from raises above each of the crosscuts. At the east end mining was started above the scraping drift to the east of No. 922 Raise in the previous year and as operations retreated west a narrow pillar on each side of the scraping drift was recovered. West of the latter area mining was underway in a pillar at the close of the year and as operations retreated west the small pillars on each side of the scraping drift were mined. Mining was also completed above the scraping drift to the west of No. 921 Raise and the narrow pillar on each side of the drift was recovered as operations retreated towards the raise. In the west half of the deposit mining was underway at the start of the year from a scraping drift to the east of No. 910A Raise. As caving operations retreated towards the raise the narrow pillars on each side of the drift were recovered. An area 150' x 20' was mined east of No. 910B Raise comprising the pillars on each side of the drift as operations retreated to the raise. At the west end of the deposit mining was underway at the close of the year above two scraping drifts advanced to the ore limits. An area 65' x 70' was mined comprising the pillars on each side of the scraping drift as operations retreated towards the raise.

In the sulphurous deposit a long narrow area 300' x 30' was mined in the west and central stopes. At the east end an area 60' x 35' was mined in the sub level stope operation that was later abandoned. Sub caving was underway in this area at the close of the year and two scraping drifts radiating in a northeasterly direction were advanced from No. 928 Raise to the ore limits and the pillar above recovered by caving.

✓ 120' Sub Level

In the sulphurous deposit an area 180' x 30' was mined in the west stope to complete the operations on this sub. In the central stope three small areas were mined separated by narrow pillars that were left when caving interrupted operations on two occasions. At the east end an area 60' x 25' was mined by sub level stoping early in the year before this method was abandoned in favor of a caving operation.