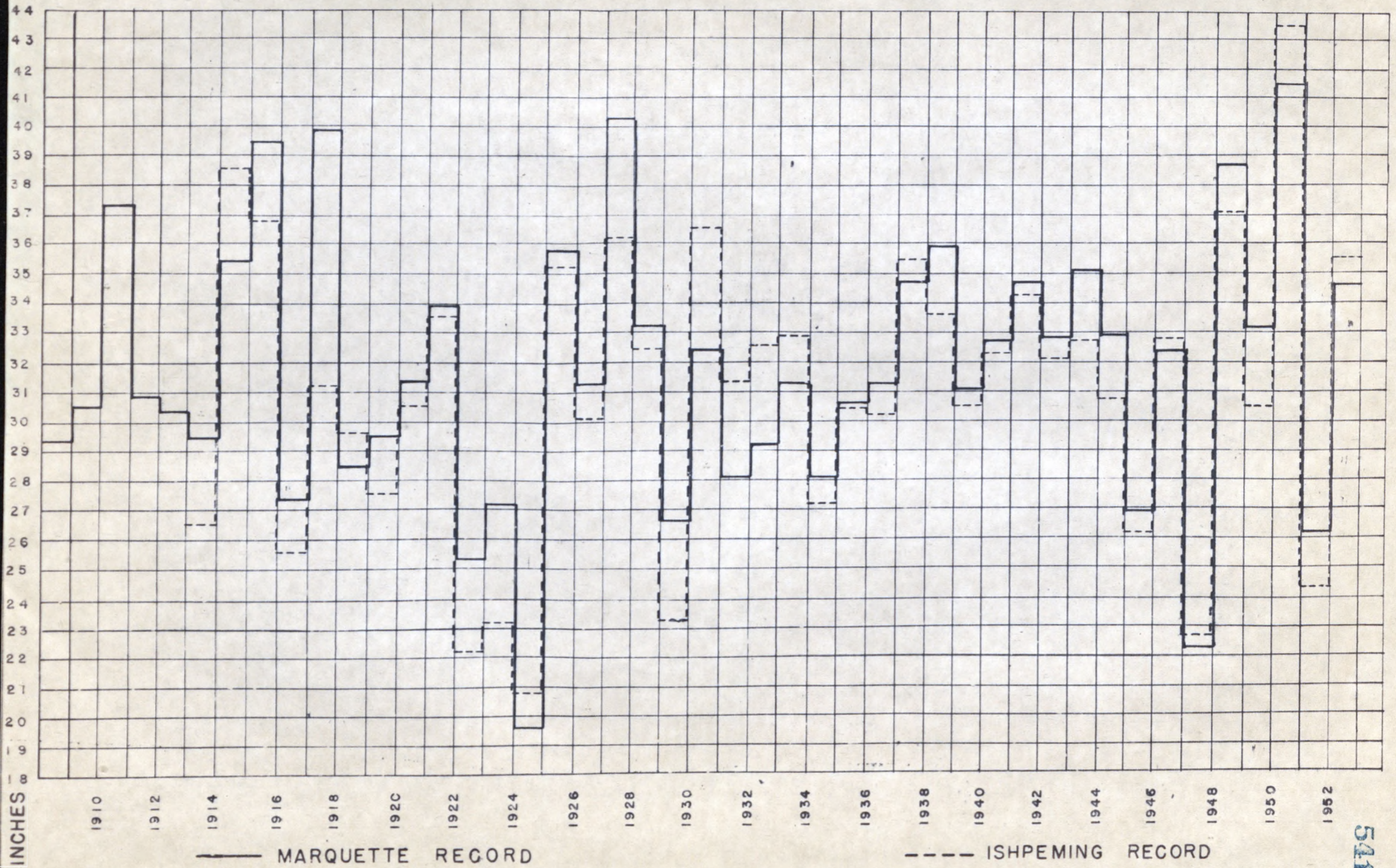


# PRECIPITATION BY YEARS





40000

1943

1944

1945

1946

1947

1948

1949

1950

1951

1952

1953

PEAK LOAD ON SYSTEM

AVERAGE SYSTEM LOAD

35000

30000

25000

20000

15000

10000

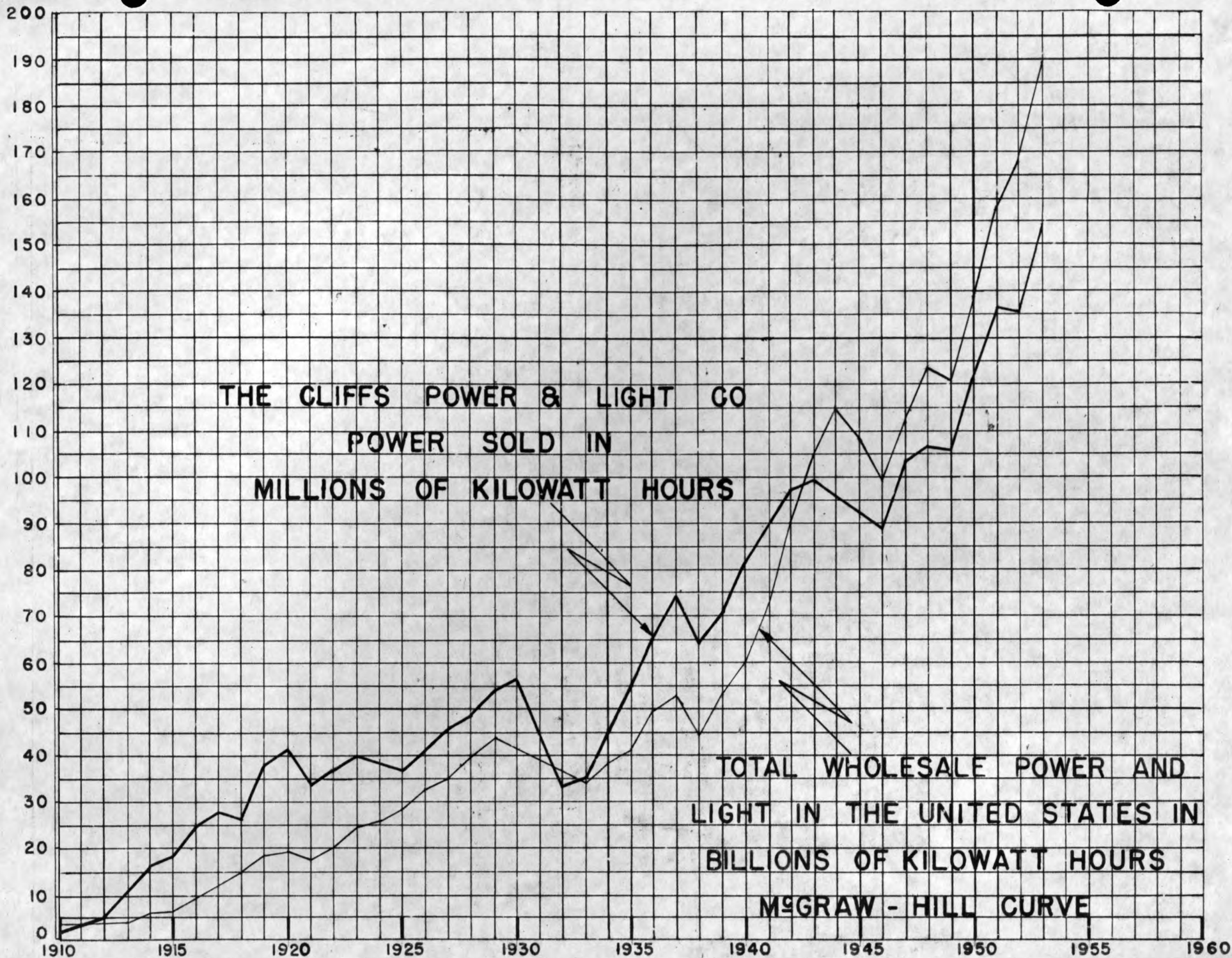
5000

KILOWATTS

STRIKE FEB. 8 TO MAY 22

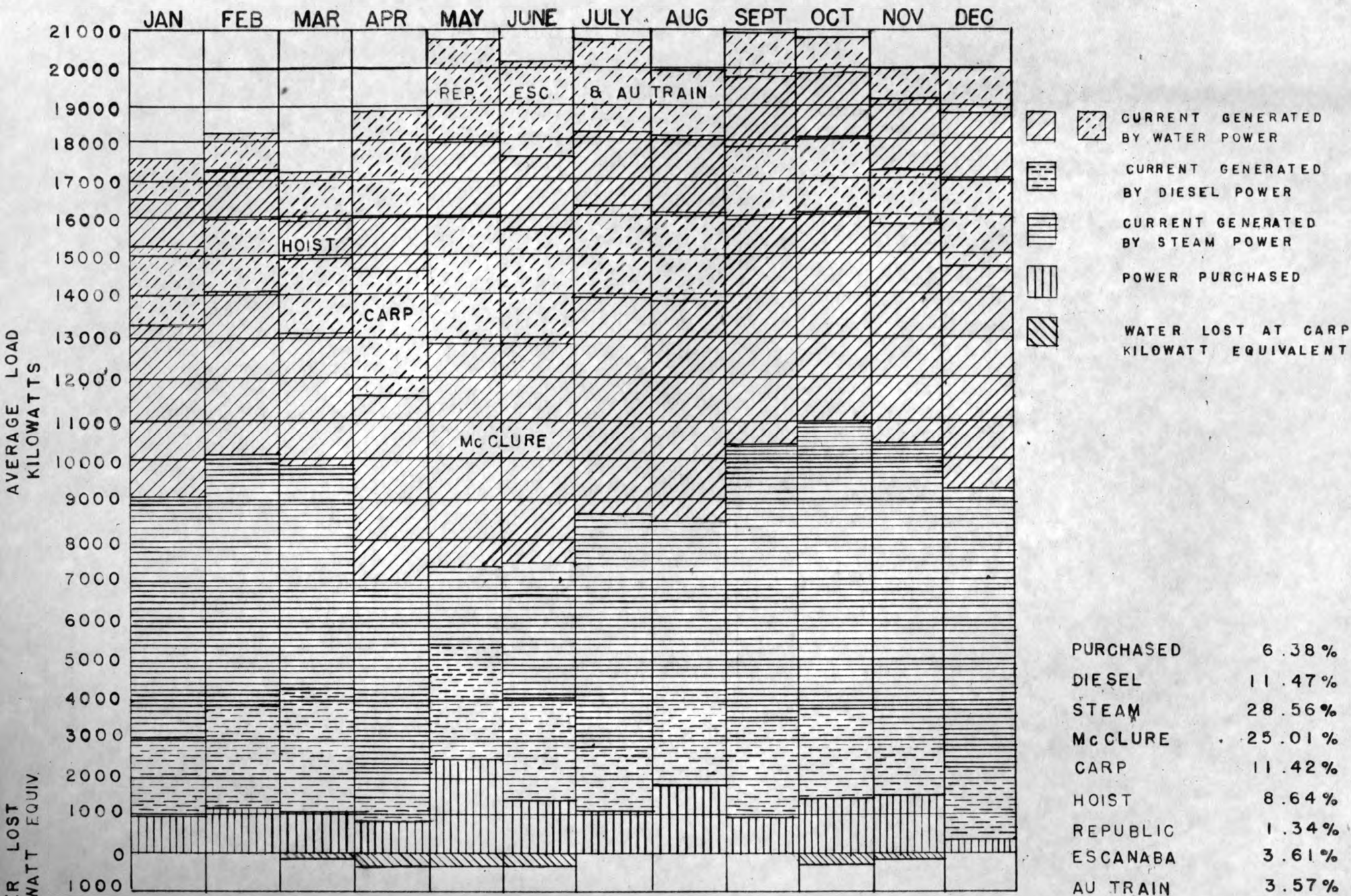
STRIKE SEPT. 30 TO NOV. 12

STRIKE JUNE 2 TO JULY 28





# 1953





WELFARE DEPT. ANNUAL REPORT YEAR 1953

The Annual Report of the Welfare Department is presented herewith:

During the year 1953, the Welfare Department performed its activities in the regular manner. These activities involve the welfare of employees of The Cleveland-Cliffs Iron Company, as well as the general welfare of this community.

The major functions of the Welfare Department involve employee welfare and relief; workmen's compensation; group insurance; social welfare; pensions; safety; police and plant protection; publication of the "Cliffs News"; public relations and Company-sponsored employee activities. We are also interested in civic and community matters and public health problems.

This Department, as has been stated in previous annual reports and which is now submitted for the purpose of record, was formerly known as the Pension Department, under the supervision of Mr. W. H. Moulton whose title was Secretary of the Pension Department. Mr. Moulton retired on July 1, 1938. The name of the Department was then changed to Welfare Department. Mr. Walter F. Gries was placed in charge, under the title of Superintendent of the Welfare Department.

Besides dealing with the various matters concerning the health, welfare, and happiness of our employees, this Department also takes part in many activities which are not directly related to "welfare." Some of these functions, however, have been undertaken by the Department of Industrial Relations which is under the direction of Mr. Ogden E. Johnson.

Mr. A. J. Stromquist, Director, and the employees of the Safety Department have cooperated fully with the Welfare Department. In previous years and in 1953 the Company and its employees have undoubtedly benefited from the combined efforts of the Welfare and Safety Departments.

Since 1926, the Compensation Department has been under the able direction of Mr. Walter E. Johnson, Compensation Agent. Mr. Johnson's efficiency, superior experience, as well as his loyal service and cooperation, have proved to be invaluable to this Department, to the Company, and to its employees.

The detail work involving the group insurance program and the pension, donation, and retirement payrolls was carried on by Mr. Lowell C. Holmgren. His experience and his faithful and untiring service have contributed much to the proper functioning of this Department.

Mrs. Marilyn Holmgren Rex, who served as Secretary to the Superintendent of the Welfare Department, resigned in September. On the first of October, Miss Ann Sundblad, who was previously employed as Secretary to Mr. Walter E. Johnson of the Compensation Department, was promoted to the position of Secretary to the Superintendent of the Welfare Department. We wish to acknowledge Mrs. Rex's loyal service to this Department--her efficiency and cooperation. Miss Sundblad has assumed the responsibilities of her work in fine fashion.



WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

Mrs. Lorelei V. Pascoe resigned from her position as Stenographer in the Compensation Department in March. On May 1, Miss Martha Roine was employed as Stenographer in the Compensation Department and on October 15 Miss Rita Chapman was hired as a Stenographer to fill the vacancy in this Department due to the promotion of Miss Sundblad. Both Miss Roine and Miss Chapman have adapted themselves to their duties in the Compensation Department.

Our Chief of Police, Mr. Robert J. Veale, who works directly under the supervision of the Superintendent of the Welfare Department, was in charge of the uniformed policemen and special deputy sheriffs during 1953. Mr. Veale contacts the Superintendent of the Welfare Department daily. Various matters concerning our Police Department and its problems are discussed whenever necessary. We appreciate Mr. Veale's continued efforts and cooperation.

Mr. Emil Hoff has been associated with the Welfare Department since September. He is becoming familiar with the Police Department and its functions since it is planned to appoint Mr. Hoff as Chief of Police upon the retirement of Mr. Veale.

In June of 1953, the Welfare Department, including the compensation, insurance, and police divisions, moved into new quarters in the addition to the Central Office building. These departments are now conveniently located on the street level.

The personnel of the Welfare Department is as follows:

Walter F. Gries, Superintendent  
Walter E. Johnson, Compensation Agent  
Lowell C. Holmgren, Assistant, Compensation and  
Group Insurance Division  
Robert J. Veale, Chief of Police  
Emil Hoff, Assistant, Chief of Police  
Miss Ann L. Sundblad, Secretary to the Superintendent  
Miss Martha Roine, Stenographer, Compensation Department  
Miss Rita Chapman, Stenographer, Compensation Department



WELFARE DEPT. ANNUAL REPORT YEAR 195311.  
a. WORKMEN'S COMPENSATION

The direct work of the Compensation Department has been taken care of by Mr. Walter E. Johnson as has been the plan since 1926.

While there were a number of cases that required extra attention during the year most of them were largely routine. However, the following cases were a little unusual.

CHARLES H. JONES - HILL-TRUMBULL MINE

Mr. Jones was employed as a repairman in the blacksmith shop of the Hill-Trumbull Mine Washing Plant. On March 26, 1953 he was one of the crew doing a riveting job when he became ill and had to be removed to his home. Upon reaching his home, he was able to walk from his car to his house, but later he went into a semi-comatose state, and later in the day was removed to a hospital. Apparently he suffered a cerebral hemorrhage from which he died on March 29, 1953. Subsequently his widow filed a claim for compensation on the ground that he died as a result of extra exertion while working on the job to which he had been assigned that day. Jones weighed about 230 pounds and it was known that he had high blood pressure, and had been treated for that condition over a period of at least two years to our knowledge. The work that he was performing on the day he became ill was not unusually strenuous, and we denied liability on that ground. The plaintiff is taking the stand that the high blood pressure was aggravated by the strenuous work. The medical information we have from an expert witness indicates that he will testify that the condition of this man's arteries had deteriorated to such a point that could be described as having rotted and that the extent of the blood pressure would have very little bearing on the rupture of the brain artery. The case had been tentatively set for hearing in January, 1954 at which time the testimony of lay witnesses will be taken and the medical testimony is tentatively scheduled to be taken in April of 1954 at Minneapolis.

EARL ROBINSON - MATHER "A" MINE

Robinson was one of a cage load of about 50 men that was being hoisted to surface on the morning of May 12, 1953. As they were being hoisted to surface, there was a power failure in the engine house, and as a result, the cage was hung up in the shaft. It is his claim that the cage stopped suddenly and bounced some due to the stretch in the rope, and as a result of the failure, he sustained an injury to his back. He was the only man who claimed any ill results from the incident. When it was found that the power failure could not be rectified within a reasonable time, it was decided to have the men climb to surface a distance of about 400 feet. The climb was made in easy stages with frequent rests and was done under the supervision of the shift bosses. On his way home from work that night, he was riding in the back seat of the car and suffered an epileptic fit while enroute. We subsequently learned that he had had two or three epileptic fits at home, and that all of them occurred while he was asleep. He was removed by his own physician to a neurologist in Milwaukee, in an attempt to discover the cause of fits.



11.  
a. WORKMEN'S COMPENSATION (Continued)

Because of the epileptic condition, the director of Industrial Hygiene felt that this man should not be employed underground because of the hazards involved, and at the time there was no available work on surface. This man had done some logging and cutting on his own, and for a time went back to that occupation, but he subsequently filed a claim for compensation on the ground that the condition of his back precluded him from doing that type of work. A hearing was scheduled, but before being held, we reached an agreement to pay Mr. Robinson a lump sum of \$3,500.00. With our knowledge of back conditions and their potentialities, it was felt that a settlement would probably be the cheapest in the long run.

ALBERT M. JOHNSON - NEGAUNEE MINE

Mr. Johnson was employed at the old Negaunee Mine for several years up to October, 1945. During the last few years of his employment he had been frequently disabled due to asthmatic attacks and pneumonia. He last worked on October 24, 1945, and was then carried on group insurance for the 13 week maximum in effect at that time. He did apply for work as a policeman following that period, but there was no such job available. Johnson then retired to a small plot of ground on the highway which he owned and lived there up until the time of the hearing with the exception of two periods when he was hospitalized for a respiratory condition. On May 14, 1953 he filed an application hearing adjustment of his claim indicating the nature of the disability was silicosis and that he was now unable to do any type of work. It was his claim that following his leaving the mine, that he had raised chickens on his farm, but states that he is now unable to do even that type of work, and that he had to dispose of the chickens. A hearing was set for June 29, 1953 and was subsequently postponed until August 13. This one also was postponed and the matter came up for hearing on December 4. Before the formal hearing was held, an offer of settlement was made by the plaintiff's attorney. It was indicated that their testimony would be to the effect that Mr. Johnson had an early state silicosis with advanced emphysema and that his doctors had attributed emphysema to silicosis. Our doctors felt that while Johnson had had fibrosis of the lung that this fibrosis was caused by several attacks of pneumonia and asthmatic attacks and a right heart failure. We did not deny that he had some emphysema, but felt that it was due to the pneumonia and asthmatic attacks that he had suffered over a period of years. A settlement on a partial basis was suggested by the plaintiff's attorney, and after some give and take discussion, a figure of \$2,500.00 was reached plus \$200.00 for expenses.

Had this case come to a hearing and assuming that an award was made against us, the potential liability for a silicosis claim is \$10,500.00. In addition we would be liable for medical expenses which up to the time of hearing was in the neighborhood of \$1,500.00 which expense had been assumed by the county and they had taken a mortgage on his house and a small plot of ground. At the time of the hearing there was roughly about \$1,000.00 due in compensation in the event that he won his claim so we felt that the offer of the above amount would be a very satisfactory settlement from our stand point, and an agreement on that basis was arranged. The Michigan Occupation Disease Law provides that there is no partial disability for silicosis, but it does provide that when a man becomes disabled from doing work that the date of disablement is determined by the Workmen's Compensation Commission. In this case Johnson claimed he became disabled in March of 1953 and the commission undoubtedly would go along on that point. A redemption agreement for \$2,500.00 was executed which covered our entire liability and the medical cost and his attorney fees will be paid by Johnson.



WELFARE DEPT. ANNUAL REPORT YEAR 1953
 11.  
 a. WORKMEN'S COMPENSATION (Continued)

Following is a list of the more serious cases other than fatalities which occurred in 1953:

<u>Mine and Report No.</u>	<u>Name</u>	<u>Nature of Injury</u>	<u>Compensation Paid to 12/31/53</u>
Athens 592	Douglas Francis, Jr.	Partial amputation of great toe	554.67
Cliffs-Shaft 1298	Robert E. Anderson	Spike penetrated rectum	606.33
Cliffs-Shaft 1304	John Blocken	Possible loss of vision in right eye	448.00*
General Storehouse 83	Leo W. Prusi	Amputation 4th & 5th fingers right hand	1050.00
Maaw 768	Walfred Lehtinen	Fracture both bones right lower leg	720.00*
Mather "A" Shaft 218	Clarence Colombe	Contused back, arms & legs	1388.33*
Mather "A" Shaft 22D	Albert Carlson	Amputation right middle finger	900.00
Mather "B" Shaft 68	Edwin Koski	Fracture right ankle	522.67
Mather "B" Shaft 75	Donald Nurmi	Fracture left wrist	791.67
Ohio 2	Charles S. Waisanen	Amputation of left foot	1500.00*
Agnew 39	William Lehto	Fracture right leg	823.55*
Hawkins 35	Raymond Crane	Fracture tip of pelvis bone	979.20
Hawkins 37	Albert Mottonen	Compression fracture 1st lumbar vertebra	481.40*
Holman-Cliffs 71	Urho Toivonen	Fracture left wrist	602.24

\*Payments still being made.  
 WELFARE DEPARTMENT



WELFARE DEPT. ANNUAL REPORT YEAR 195311. a. WORKMEN'S COMPENSATION (Continued)FATALITIES

The following fatalities occurred in 1953.

OTTERINO CATTO

Age 45

Negaunee Shaft

Occurred August 20, 1953

The workmen were barring loose about three feet from the floor of the drift when a big chunk peeled off up the side of the drift and over the back of the cage plat. The chunk fell on Catto. He was in a doubled up position under the chunk and his face was facing where the men had been barring. As the chunk fell, it also took down the trolley line and air pipe. The trolley line was directly over Catto's back.

Died on August 20, 1953.

Dependants - wife and daughter

Compensation 400 weeks @ 30.00 per week \$12,000.00

Funeral expense 400.00

\$12,400.00MIKE TRTICA

Age 73

Hill-Trumbull Mine

Occurred September 14, 1953

From the investigation it appeared that Mr. Trtica was carrying some sand in a shovel to put on oily ties when he was struck by locomotive #204 and dump cars. Locomotive and dump cars ran over Mr. Trtica, killing him instantly.

Died on September 14, 1953

Dependants - none

Payment to Special Compensation Fund \$300.00

Funeral expense 450.00

\$750.00

WELFARE DEPARTMENT

WELFARE DEPT. ANNUAL REPORT YEAR 195311.  
a. WORKMEN'S COMPENSATION (Continued)

Settlements on a partial disability basis were made in the following cases during 1953. The table below indicates the percentage of permanent disability and the member involved.

Andy Columbo	Hill-Trumbull	15% of back	1,350.00
Martin Calder	Hill-Trumbull	5% left index finger	64.00
Mike Zinniel	Hill-Trumbull	20% left ring finger 25% left little finger	320.00
Dean Ellis	Hill-Trumbull	10% right index finger	128.00
Toivo Raud	Holman-Cliffs	10% right index finger	128.00
Urho Toivonen	Holman-Cliffs	5% left wrist	352.00
Ralph Muller	Holman-Cliffs	40% right ring finger	350.00
Raymond Plourde	Hawkins	5% right leg	352.00
James Crowe	Canisteco	20% of back	1,152.00
Robert Shelton	Canisteco	20% right index finger	256.00
Caryle Garrett	Hawkins	10% left knee	704.00
Kenneth Jacobs	Hawkins	14% loss of hearing in right ear 36.6% loss in left ear	892.32
John Ruona	Hawkins	85% right index finger	1,088.00
George Meyers	Canisteco	20% right arm	1,472.00

WELFARE DEPARTMENT



## WELFARE DEPT. ANNUAL REPORT YEAR 1953

11.

a. WORKMEN'S COMPENSATION (Continued)Compensation Payments including Medical and Special Expense

<u>Year</u>	<u>C. C. I. Co.</u>	<u>Negaunee Mine Co.</u>	<u>Athens Ir. Mng. Co.</u>	<u>Cliffs Pr. &amp; Light Co.</u>	<u>Mesaba-C. Mng. Co.</u>	<u>CCI Co. Opt. Agt. Atkins</u>	<u>Humboldt Mng. Co.</u>	<u>Miscellaneous Companies</u>	<u>TOTAL</u>
1912 to 1943	1,465,602.79	242,486.72	159,805.78	19,665.92	110,091.18			10,282.71	2,007,935.10
1944	66,219.66	21,147.85	11,489.34	1,594.75	6,325.95				106,777.55
1945	85,558.58	32,400.22	7,152.70	1,468.50	5,630.00				132,210.00
1946	84,009.42	25,391.20	5,373.63	1,528.50	7,693.03	174.50			124,170.28
1947	76,355.69	28,582.02	14,540.71	1,153.75	9,186.43	1,353.77			131,172.37
1948	73,727.12	28,162.82	8,548.15	687.00	9,083.73	824.57			121,033.39
1949	96,910.98	37,433.06	15,401.72	916.50	9,356.57	1,248.75			161,267.58
1950	87,512.40	35,352.22	12,815.81	740.00	10,757.22	3,522.62			150,700.27
1951	111,447.53	45,102.62	10,814.25	734.50	13,757.87	1,286.55			183,143.32
1952	125,226.20	51,320.60	13,005.82	1,187.22	20,234.46	1,159.70	56.40		212,190.40
1953	<u>119,178.56</u>	<u>56,553.21</u>	<u>14,997.55</u>	<u>689.20</u>	<u>12,392.29</u>	<u>336.50</u>	<u>343.45</u>		<u>204,490.76</u>
	2,401,748.93	603,932.54	273,945.46	30,365.84	214,508.73	9,906.96	399.85	10,282.71	3,545,091.02

## Detail of Miscellaneous Companies:

Holman-Cliffs Mining Company	2,131.39
Canisteo-Cliffs Mining Company	2,768.69
Alexandria Mine	<u>5,382.63</u>
	10,282.71

WELFARE DEPARTMENT







WELFARE DEPT. ANNUAL REPORT YEAR 195311.  
a. WORKMEN'S COMPENSATION (Continued)ANNUAL STATEMENT OF COMPENSATION PAYMENTS  
FROM JANUARY 1st, 1953 to DECEMBER 31st, 1953

Compensation paid on 1953 cases	32,937.96	
Estimated compensation still pending	153,445.38	
Cost of medical and hospital service and special expenses	<u>80,458.09</u>	266,841.43
Less pending for years 1944 to 1952 inclusive	135,484.38	
Less medical and special expense on accidents occurring prior to January 1, 1953	<u>22,245.75</u>	
		<u>167,730.13</u>
		99,111.30
Less compensation paid on 1953 occupational disease cases		<u>882.66</u>
Estimated cost of 1953 accidents		98,228.64
Percentage of payrolls on accidents		.00410
Percentage of payrolls including Occupational Disease cases		.00418
Number of fatal accidents		2
Number of compensable accidents		154
Number of lost-time accidents - non-compensable		221
Number of slight accidents		1228

The following occupational disease cases occurred during 1953. The cost of these cases is included in the regular compensation costs, but for statistical purposes they are not included in the accident table.

Number of deaths	0
Number of disability cases	5

Four men drawing occupational disease benefits died during 1953. In all cases the disability commenced prior to January 1, 1953.

During 1953 a total of \$16,260.49 was paid on occupational disease cases and it is estimated it will cost \$9,796.67 to complete payments on the twelve cases still active on December 31, 1953. Of these two originated in 1948, four in 1949, three in 1950, one in 1951 and two in 1953.

WELFARE DEPT. ANNUAL REPORT YEAR 1953

11.  
c. GROUP INSURANCE (Continued)

The following statement shows the amount of claims paid under the group insurance and hospitalization plan during the policy year from March 1, 1953 to February 28, 1954.

	<u>Hospitalization</u>	<u>Health &amp; Accident</u>	<u>Death Claims</u>	<u>Total</u>
Bunker-Hill	1,071.91	707.15		1,779.06
Cambria-Jackson	11,352.66	6,132.88		17,485.54
Cliffs-Shaft	28,963.16	13,589.99	7,500.00	50,053.15
Cleveland Roll	2,379.21	248.58		2,627.79
General Roll	12,673.29	3,818.55	7,500.00	23,991.84
General Storehouse	9,370.06	3,822.86	7,500.00	20,692.92
Inactive			28,375.00	28,375.00
Lloyd	6,622.42	4,315.73	5,000.00	15,938.15
Maas	22,641.58	8,580.03	12,500.00	43,721.61
Miscellaneous	1,590.12	381.43		1,971.55
Negaunee Shaft	7,093.10	3,857.14	13,750.00	24,700.24
Ohio	6,071.62	711.43	2,500.00	9,283.05
Spies	4,822.17	1,067.14	5,000.00	10,889.31
Tilden				
Total - C. C. I. Co.	114,651.30	47,232.91	89,625.00	251,509.21
Mather Mine "A" Shaft	38,784.56	17,554.31	7,500.00	63,838.87
Mather Mine "B" Shaft	28,419.89	6,762.80	7,500.00	42,682.69
Total - Negaunee Mine Co.	67,204.45	24,317.11	15,000.00	106,521.56
Athens Iron Mining Co.	17,982.04	8,018.55	7,500.00	33,500.59
Cliffs Power & Light Co.	4,444.50	1,452.86	2,500.00	8,397.36
Humboldt Mining Co.	2,497.50	827.13		3,324.63
Total -Michigan District	206,779.79	81,848.56	114,625.00	403,253.35
Bargaining Unit	180,388.02	74,292.93	89,500.00	344,180.95
Salaried & Non-Barg.Unit	26,391.77	7,555.63	25,125.00	59,072.40
	206,779.79	81,848.56	114,625.00	403,253.35
Number of Claims				
Bargaining Unit	1,686	433	39	2,158
Salaried & Non-Barg.Unit	280	65	6	351
	1,966	498	45	2,509

WELFARE DEPARTMENT



## WELFARE DEPT. ANNUAL REPORT YEAR 1953

11.

c. GROUP INSURANCE (Continued)

The following death claims were paid during the period from March 1, 1953 through February 28, 1954.

<u>Name</u>	<u>Mine</u>	<u>Date of Death</u>	<u>Amount of Insurance</u>
Paul Zoppetti	Athens Mine	8-19-53	2500.00
John Nigra	Athens Mine	12-9-53	2500.00
Samuel S. Veale	Athens Mine	12-29-53	2500.00
David R. Farm	Cliffs-Shaft Mine	3-15-53	2500.00
William Lawer	Cliffs-Shaft Mine	7-11-53	5000.00
Carl H. Jackson	Cliffs Power & Light Co.	2-12-53	2500.00
John R. Stark	General Roll	12-13-53	7500.00
Edward N. McComber	General Storehouse	4-21-53	2500.00
Carl Aho	General Storehouse	8-8-53	5000.00
William Nelson	Lloyd	4-30-53	5000.00
Oscar Frassetto	Maas Mine	2-21-53	5000.00
Kosti V. Rajala	Maas Mine	7-22-53	2500.00
Albert Johnson	Maas Mine	11-3-53	5000.00
Wilfred R. LaMere	Mather Mine "A" Shaft	7-11-53	2500.00
Henry Kumpula, Jr.	Mather Mine "A" Shaft	7-9-53	5000.00
Lauri Poutanen	Mather Mine "B" Shaft	11-27-53	2500.00
Sidney A. Argall, Jr.	Mather Mine "B" Shaft	12-3-53	5000.00
Paul J. Pietro	Negaunee Shaft	5-21-53	5000.00
Henry Bean	Negaunee Shaft	8-1-53	2500.00
Otterino Catto	Negaunee Shaft	8-20-53	6250.00
Robert Heilala	Ohio Mine	4-27-53	2500.00
Philip R. Johnson	Spies Mine	5-6-53	5000.00
Jawob E. Kujala	Inactive	2-14-53	2500.00
John Koski	Inactive	2-24-53	1250.00
Michael Denofrio	Inactive	3-4-53	1250.00
Ferdinand Leinonen	Inactive	2-26-53	750.00
William Wicklund	Inactive	3-22-53	2500.00
William T. Ninnis	Inactive	3-29-53	500.00
Jacob Hautala	Inactive	4-4-53	750.00
John Burgeson	Inactive	4-4-53	750.00
Archie Dubord, Sr.	Inactive	4-17-53	1250.00
John Meni	Inactive	4-24-53	750.00
William Kamppinen	Inactive	5-4-53	2500.00
John Cleven	Inactive	5-13-53	750.00
William C. Oliver	Inactive	7-2-53	3125.00
Fabian F. Page	Inactive	8-3-53	1250.00
Carl Balzarini	Inactive	9-28-53	500.00
William Pearce	Inactive	10-1-53	750.00
Vincent DeToma	Inactive	10-23-53	2500.00
John Walimaa, Sr.	Inactive	10-27-53	500.00
Albert Mattson	Inactive	10-27-53	750.00
Erland M. Wienola	Inactive	11-13-53	1250.00
David Smolander	Inactive	9-10-53	750.00
Carl F. Sundquist	Inactive	11-30-53	750.00
August R. Norell	Inactive	2-5-54	750.00



WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

11.  
c. GROUP INSURANCE

During the year a group life, disability, hospitalization and surgical fee insurance plan was available to our employees, both bargaining and non-bargaining. This plan is carried with the Aetna Life Insurance Company of Hartford, Connecticut under group policies 14,440, GS-14,440, and H-14,440 and almost one hundred per cent of our eligible employees subscribe to and are covered by it. Originating on September 1, 1947, the benefits of the plan were liberalized on March 1, 1950 and June 1, 1952. The details of the original plan may be found in the Annual Report of 1947 and the liberalizations are covered in the Annual Reports of 1950 and 1952.

The benefits provided by the plan for bargaining unit employees during the year are as follows:

1. Life Insurance - \$2,500 - \$5,000 - \$6,250 according to schedule based on annual earnings.
2. Disability from sickness or non-occupational accident - \$30.00 weekly for a maximum period of 26 weeks.
3. Daily Hospitalization Benefit for Employee - \$7.50 daily to a maximum of seventy days.
4. Incidental Hospital Charges - \$75.00 maximum for employee.
5. Daily Hospitalization Benefit for Dependent - \$6.50 daily to a maximum of seventy days.
6. Incidental Hospital Charges for Dependent - \$65.00 maximum.
7. Surgical Fee Benefits - According to schedule with a maximum of \$200.00 for both employee and dependent.

The benefits provided by the plan for non-bargaining hourly wage employees are the same as those listed above and for salaried employees they are the same for those coverages noted under numbers two through seven. The life insurance for salaried employees was liberalized effective October 1, 1953 to provide the following classes of coverage in addition to those listed under number one above:

<u>Class</u>	<u>Life Insurance</u>	<u>Premium:</u>	<u>With Dependents</u>	<u>Without Dependents</u>
4	7,500		7.62	5.97
5	10,000		9.12	7.47
6	12,500		10.62	8.97
7	15,000		12.12	10.47
8	17,500		13.62	11.97
9	20,000		15.12	13.47

The following schedule of annual earnings covers the above classes of insurance:

- Class 4 - \$6,000 but less than \$7,500
- 5 - \$7,500 but less than \$10,000
- 6 - \$10,000 but less than \$12,500
- 7 - \$12,500 but less than \$15,000
- 8 - \$15,000 but less than \$17,500
- 9 - \$17,500 and over



WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

11.

c. GROUP INSURANCE (Continued)

Reference is made to the Annual Reports of 1936 and 1937 for a description of the Company's first group insurance plan which included only group life and disability insurance.

On March 1, 1950 a separation between bargaining unit and non-bargaining unit employees was made in both premium computation and payment of claims. Two sets of premium rates are used because of this separation when the overall premium cost of group insurance is computed. The rates for the policy year from 3/1/1953 through 2/28/1954 follow.

	Premium Rate
<b>Bargaining Units:</b>	
Life	- Per month per \$1,000      1.26
Disability	- Per month per \$1.00      .088
<b>Hospitalization Insurance:</b>	
Employee Daily Hosp. Benefit	- Per month per \$1.00      .17
Employee Surgical Fee Benefit	- Per month per employee      .45
Dependent Daily Hosp. Benefit	- Per month per \$1.00      .374
Dependent Surgical Fee Benefit	- Per month per employee      1.66
 <b>Salaried and Non-Bargaining Units:</b>	
Life	- Per month per \$1,000      1.67
Disability	- Per month per \$1.00      .088
 <b>Hospitalization Insurance:</b>	
Same as for Bargaining Units	

For information it is mentioned that the Company's contribution toward the premium cost of group insurance is fixed contractually at 2 1/2 cents per hour actually worked by bargaining unit employees. The employees' contribution toward the premium cost of the insurance is at a fixed rate according to schedule.



WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

11. c. GROUP INSURANCE (Continued)

The following table shows a tabulation from the group insurance premium statements prepared by this office of the total premium cost by unit of our group insurance plan for the policy year from March 1, 1953 through February 28, 1954:

<u>Unit</u>	<u>Premium Cost</u>	
	<u>Bargaining Units</u>	<u>Non-Bargaining Units</u>
Bunker Hill	4,553.99	540.01
Cambria-Jackson	32,055.62	3,276.60
Cliffs-Shaft	71,437.93	5,845.73
General Storehouse & Shops	27,459.01	1,044.96
General Payroll - Ishpeming Office	-	56,947.38
Lloyd	19,181.14	1,930.98
Maas	56,470.34	4,521.17
Miscellaneous Payroll - Cliffs-Shaft Lab.	5,316.87	-
Negaunee Shaft	18,948.39	2,083.61
Ohio	8,006.61	943.21
Spies	13,904.31	1,824.25
Tilden	1,259.36	712.00
Mather Mine "A" Shaft	98,665.40	11,068.50
Mather Mine "B" Shaft	82,331.22	9,655.95
Athens	34,677.08	3,717.65
C. P. & L. Co.	8,096.06	1,600.12
Electric Power Dept.	554.31	106.75
Humboldt	5,803.55	459.83
Inactive	5,277.36	1,899.44
TOTALS	493,998.55	108,178.14

WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

23. a. PENSION SYSTEM (Continued)

Retirement Payrolls

The purpose of the Retirement Payrolls was to supplement Social Security benefits being paid to our retired employees under that program. The payrolls were initiated on March 16, 1939 and were the major retirement plan of the Company through February 1950 when the Pension Plan of March 1, 1950 came into being. This latter Pension Plan has all but eliminated additions to the Retirement Payrolls, and any additions now are in the nature of special cases.

A retired employee's Social Security benefit was originally supplemented by \$10.00 per month over The Retirement Payrolls and beginning with July 1948 this amount was increased by \$10.00 per month in all cases so that the usual allowance over the payroll was \$20.00 per month. Our retired employees carry fifty per cent of the life insurance in force on their lives at the time of their retirement. Since March 1, 1950 this is done without cost to the employee.

The following two men were added to the Mining Department Retirement Payroll during 1953:

John Rosten	Negaunee Mine	Eff. 2/1/1953	\$25.00 per month
William Stanaway	Cambria-Jackson	Eff. 7/1/1953	\$20.00 " "

Thirteen retired employees being paid over this Payroll died during 1953:

Sam Stephens	Number 130	\$20.00	Died 1/16/1953
William T. Ninnis	137	"	3/29/1953
William Wicklund	275	35.00	3/22/1953
John Bergeson	51	20.00	4/4/1953
Jacob Hautala	242	"	4/4/1953
John Meni	276	"	4/24/1953
John Cleven	131	"	5/13/1953
Fabian Page	256	"	8/3/1953
William Pearce	114	"	10/1/1953
Carl Balzarini	211	"	9/28/1953
David Smolander	236	"	9/10/1953
John Walimaa, Sr.	64	"	10/27/1953
Carl F. Sundquist	150	"	11/30/1953

Two Retirement Payrolls are prepared in this office to handle payments to Minnesota retired employees, one for the Canisteo Mine and the other for the Mesaba-Cliffs Mining Company - Mining Department.

There were no additions to the Canisteo Mine Retirement Payroll during the year. Two deaths as follows were recorded on the payroll:

Louis A. Jacobson	Number 10	\$20.00	Died 4/1953
Jac Kokko	11	"	10/11/1953



WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

23. a. PENSION SYSTEM (Continued)

Retirement Payrolls (Cont'd)

There were no additions to the Retirement Payroll of The Mesaba-Cliffs Mining Company - Mining Department during 1953. There was one death as follows:

George E. Haynes, Sr.	Number 3	\$20.00	Died 9/27/1953
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A resume of the 1953 Retirement Payrolls follows:

Number of Mining Department Retired Employees 12/31/1952	162
Number of Mining Department Retired Employees 12/31/1953	151
Total Expenditure to above employees for year 1953	41,043.84
Number of Canisteo Mine Retired Employees 12/31/1952	5
Number of Canisteo Mine Retired Employees 12/31/1953	3
Total Expenditure to above employees for year 1953	1,000.00
Number of Mesaba-Cliffs Mng. Co. Retired Employees 12/31/1952	22
Number of Mesaba-Cliffs Mng. Co. Retired Employees 12/31/1953	21
Total Expenditure to above employees for year 1953	5,220.00
Total Number of Retired Employees 12/31/1952	189
Total Number of Retired Employees 12/31/1953	174
Total Expenditure to retired employees for year 1953	47,263.84

WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

23.  
a. PENSION SYSTEM

Pension Plan of 1/1/1909

The Company's original pension system went into effect on January 1, 1909 and the forty-fifth year of its operation was completed in 1953.

No changes in the rates of pensions were made during the year. On January 1, 1933 pensions being paid were reduced by fifty per cent, those under \$20.00 remaining the same and those over \$20.00 having a minimum rate of \$20.00. There have been no additions to these payrolls since January 1, 1932.

During the time the Plan was active individual payrolls were written for the following Departments:

Mining Department  
Holmes Mine Department  
Republic Mine Department  
Land Department  
Furnace Department

Of these only the Mining and Republic Mine Department payrolls were active during the year. Beginning with July 1953 the one pensioner remaining on the Republic Mine Department payroll was transferred to the Mining Department payroll for future payment.

There are four pensioners being paid over the Mining Department Pension Payroll at the close of 1953. This includes Frank Vierela who was formerly on the Republic Mine Department Pension Payroll. The total expenditure over the Mining Department Pension Payroll for 1953 was \$796.00. This latter figure includes \$120.00 paid Frank Vierela at the rate of \$20.00 per month from July through December 1953. There were no deaths on the payroll during the year.



WELFARE DEPT.                      ANNUAL REPORT                      YEAR 1953

23.  
a. PENSION SYSTEM (Continued)

The table below shows the pension payments for the Mining Department and Holmes Mine Department combined for the years 1908 through 1953. The Holmes Mine Department payroll became inactive with the death of its last pensioner on April 23, 1949.

<u>Year</u>	<u>Old Age</u>	<u>Widows and Orphans</u>	<u>Total</u>
1908 thru 1942	765,883.48	22,547.00	788,430.48
1943	10,246.66	-	10,246.66
1944	8,485.25	-	8,485.25
1945	7,446.32	-	7,446.32
1946	5,648.60	-	5,648.60
1947	4,156.68	-	4,156.68
1948	3,840.68	-	3,840.68
1949	3,260.68	-	3,260.68
1950	2,400.68	-	2,400.68
1951	1,438.78	-	1,438.78
1952	1,076.00	-	1,076.00
1953	796.00	-	796.00
	814,679.81	22,547.00	837,226.81

Includes payment of \$2,500.00 made by the Cleveland office in 1930.

Republic Mine Department

Mr. Frank Vierela was the only pensioner on this payroll during the year and he was paid a total of \$120.00 over the Republic Mine Department Pension Payroll. He was transferred to the Mining Department Pension Payroll on July 1, 1953 for future payment of his pension, closing out the Republic Mine Department payroll which will remain inactive in the future.

During its active years - 1920 through June 1953 - a total of \$149,689.04 was expended over the Republic Mine Department Pension Payroll.

Land Department

Mr. Erick Johnson, the last pensioner on this Pension Payroll, died on June 23, 1953 and the payroll will be inactive in the future. A total of \$120.00 was paid to Mr. Johnson during the year.

During its active years - 1927 through June 1953 - a total of \$6,836.88 was expended over the Land Department Pension Payroll.

Furnace Department

This payroll became inactive in 1948. During the years when it was active - 1910 through 1948 - a total of \$66,155.22 was expended over the Furnace Department Pension Payroll.

WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

23. a. PENSION SYSTEMS (Continued)

Pension Plan of 3/1/1950

The Pension Plan of March 1, 1950 remained in force during the year without change. This Department continued to handle the initial processing of all pension applications, submitting them to the Pension Committee in Cleveland for final action. The details of the Plan may be found in the Annual Report for 1950.

Since Social Security benefits are such an important consideration in the Pension Plan, it is here mentioned that there were no changes in the method of computation during the year.

During the year the following age pensions were granted:

<u>Name</u>	<u>Mine</u>	<u>Eff. Date</u>	<u>Gross Pension</u>	<u>Soc. Sec.</u>	<u>Net Pens.</u>
Chester A. Nelson	Gen. Sthse.	1-1-53	100.00	69.60	30.00
Nikola Medakovich	Agnew	2-1-53	88.32	84.10	4.00
Svante Korpela	Cambria-Jackson	"	100.00	80.65	19.00
Matt Lammi	Maas	"	100.00	78.70	21.00
Richard Roberts	Spies	"	100.00	81.90	18.00
William C. Tourville	Gen. Sthse.	"	140.38	80.10	60.00
Thomas C. Hodge	Maas	3-1-53	125.37	85.00	40.00
Delore J. Roy	"	4-1-53	124.14	85.00	39.00
Norman Vassar	Spies	"	100.00	85.00	15.00
Samuel V. Maki	Agnew	3-1-53	86.32	85.00	1.00
Godfrey J. Silas	Gen. Sthse.	6-1-53	71.64	84.10	-
Robert R. Hosford	Sargent	11-1-52	91.68	85.00	7.00
John A. Johnson	Hawkins	2-1-53	92.32	85.00	7.00
Isaac A. Martolin	Sargent	6-1-53	94.00	85.00	9.00
Matthew Beckerleg	Cliffs-Shaft	10-1-53	98.00	82.90	15.00
Otto Hanninen	Maas	9-1-53	105.51	84.00	22.00
Fred Thomas	Cambria-Jackson	10-1-53	91.00	85.00	6.00
Peter Drca	Hawkins	7-1-53	93.00	68.50	25.00
William L. Harris	Gen. Sthse.	9-1-53	119.11	85.00	34.00
William Vertanen	Maas	11-1-53	100.00	69.30	31.00
Joseph F. Stanich	Sargent	12-1-53	95.68	85.00	11.00
Charles P. Partanen	Mather "A" Shaft	2-1-53	96.32	85.00	11.00
Onni Rantanen	" "B" Shaft	4-1-53	100.00	81.40	19.00
Sam Kivisto	" "A" Shaft	5-1-53	95.68	85.00	11.00
John Rosten	Negaunee Mine	2-1-53	100.00	51.30	49.00
Archie Vecellio	Athens	1-1-53	100.00	67.30	33.00
Charles J. Waara	"	3-1-53	100.00	85.00	15.00
Arcangelo Yannone	"	5-1-53	100.00	61.70	38.00
Edward Hooper	"	6-1-53	96.32	85.00	11.00
Oscar Wertanen	"	7-1-53	97.00	83.80	13.00
Peter N. Nelson	Hill-Trumbull	6-1-53	100.00	82.20	18.00
Alfred E. Johnson	Holman-Cliffs	6-1-53	64.32	77.40	-
Carmen Vacca	"	"	100.00	82.00	18.00



WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

23. a. PENSION SYSTEMS (Continued)

Pension Plan of 3/1/1950 (Continued)

The following disability pensions were approved during the year:

<u>Name</u>	<u>Mine</u>	<u>Eff. Date</u>	<u>Gross Pension</u>	<u>Net Pension</u>
John S. Carlson	Gen. Sthse.	5-1-52	50.00	50.00
Joseph L. Riberdy	Lloyd	11-1-53	87.73	88.00
Earl Rule	Negaunee Shaft	7-1-53	101.10	101.00
Herbert J. Blomquist	Mather "A" Shaft	11-1-53	87.00	87.00
John W. Kurikkala	Athens	10-1-53	53.04	53.00

Pensions as follows were discontinued:

William Kauppinen	Maas	Ref. Ret. #	CC-1	Died 5/4/1953
Nestor Mattila	Cliffs-Shaft		CC-3	" 2/1/1953
Vincent DeToma	"		CC-101D	" 10/23/1953
Jacob E. Kujala	Athens		AM-7	" 2/14/1953
Archangelo Yannone	"		AM-11D	Converted to age pension effective 5/1/1953
Archie Dubord, Sr.	C. P. & L. Co.		CPL-1	Died 4/17/1953

WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

23.  
a. PENSION SYSTEMS (Continued)

Pension Plan for Salaried Employees

The Pension Plan for Salaried Employees which became effective on 1/1/1951 was continued in force without change during the year. The details of this Plan may be found in the Annual Report of 1951.

This Department handles the initial processing of all pension applications under this Plan and submits them to the Pension Committee in Cleveland for final disposition.

During the year the following pensions were granted under the Plan:

<u>Name</u>	<u>Former Occupation</u>	<u>Eff. Date</u>	<u>Gross</u>	<u>Deductions</u>	<u>Net</u>
William Lawer (Disability)	Mechanical Foreman Cliffs-Shaft Mine	3-1-53	70.55	CR 60.84	10.00
Charles P. Johnson (Age)	Caretaker - Negaunee Dispensary	4-1-53	100.00	SS 66.60	33.00
Arthur Nault (Age)	Surface Foreman - Lloyd Mine	6-1-53	132.38	SS 85.00 CR 64.52	-
Thomas Tippet (Age)	Mining Captain - Lloyd Mine	7-1-53	196.89	SS 85.00 CR 131.77	-

Code letters for deductions: CR - Contributory Retirement or Annuity  
SS - Social Security Benefits

The following pensions were discontinued during the year:

William Lawer (Disability)	Mechanical Foreman - Cliffs-Shaft Mine	Ref. Ret. # S-6D	Died 7/11/1953
Charles P. Johnson (Disability)	Caretaker - Negaunee Dispensary	Ref. Ret. # S-8D	Converted to age pension 4/1/53

Contributory Retirement Plan for Salaried Employees

For the purpose of record it is here mentioned that the Company has had in effect for its salaried employees, since December 31, 1940, a Contributory Retirement Plan to which both the Company and the employees contribute. This Plan is carried with the Aetna Life Insurance Company of Hartford, Connecticut under group policy GA-228, and it is administered completely by the Cleveland Office. Participation upon meeting certain eligibility requirements is optional.



WELFARE DEPT. ANNUAL REPORT YEAR 195323. b. REPUBLIC MINE FUNDS

Since these funds are no longer in existence, we recommend referring to our annual report of 1949 for any desired information.

c. SUSPENSE FUNDS

Our annual report of 1949 can supply information regarding this fund which has been closed out.

d. VISITING NURSES

After the resignation of Mrs. Milton Cain in September, we decided to try to maintain the services of our nursing department with one nurse. Miss Myrtle Welander, who was formerly assigned to the Ishpeming area, now covers both the Ishpeming area and the Negaunee area. A trial period of one year has been established. Mrs. Cain's service to the Company and its employees is appreciated. Miss Welander performs her duties in an efficient manner. She is ambitious and will no doubt be able to carry on the added work in her usual manner. Weekly reports, which are on file in this Department, were submitted by the visiting nurses and they consulted the Superintendent of the Welfare Department whenever necessary. These practices will be continued.

As previously recorded in our annual reports, the Company established its visiting nurse program in Ishpeming on May 1, 1908 and in Negaunee on September 8, 1912. These services were also provided our employees in Gwinn from September 1, 1910 until October 1, 1927, when the Gwinn mines were closed.

The following nurses were employed during 1953:

Miss Myrtle Welander, R. N. - Ishpeming Area  
Mrs. Milton Cain, R. N. - Negaunee Area

i. SAFETY WORK

The Central Safety Committee, under the direction of Mr. A. J. Stromquist, Safety Director, held monthly meetings during 1953. At each meeting Mr. Stromquist presents a review of all accidents previous to the meeting and a general discussion is then held. During the discussion, a study of every accident is made in order to lessen or eliminate the possibility of such an accident occurring in the future. A classification of each accident is then made.

Central Safety Meetings were held on the following dates in 1953:

January 16	July 17
February - no meeting	August 18
March 9	September 21
April 20	October 14
May 11	November 11
June 23	December 18

WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

23. i. SAFETY WORK (CONT'D)

The roster of the Central Safety Committee as of December 31, 1953 was as follows:

Grover J. Holt	Max Madsen
J. S. Westwater	R. M. DeGabriele
S. W. Sundeen	J. M. Haivala
H. H. Korpinen	LeRoy Hosking
Onnie Marjama	G. A. Dawe
W. R. Atkins	R. L. Tobie
H. C. Swanson	O. E. Johnson
G. M. Waldie, M. D.	J. S. Bowen
B. E. Moore, M. D.	A. J. Stromquist
H. W. Sundberg	T. W. Hill
J. D. Preston	Ernest Bengry
E. D. Cory	W. F. Gries
C. R. Sundeen	W. E. Johnson
R. G. Schaal	Ray Lukkarinen
G. T. Hollett	A. E. Lillstrom
H. W. Rembold	K. C. Olson
L. J. Erck	Arne Andelin
T. A. Kauppila	Bernhardt Peterson
J. A. Poll	Keith Busby

23. j. MEDICAL SERVICE

The contract which the Company has with Doctors A. W. Erickson of Ishpeming and R. L. Paine of Negaunee for the coverage and care of all occupational injuries and accidents remains in effect. This system has proved to be satisfactory to the Company and its employees.

IRON RIVER HOSPITAL

During the year, several visits were made at the General Hospital of the Iron River District at Stambaugh, Michigan. The annual meeting was attended by Mr. J. M. Haivala, Superintendent of the Spies Mine at Iron River, in the absence of the Superintendent of the Welfare Department. The Superintendent of the Welfare Department represents the Company on the Board of Trustees. This hospital provides medical and hospital services to our employees at the Spies Mine at Iron River. The General Hospital of the Iron River District is managed by a Board of Trustees representing the various stockholding mining companies. Its administration and operation is very effective.

Dr. L. E. Irvine continues to furnish the necessary medical attention to our employees at the Spies Mine. Physical examinations, both pre-employment and periodical, are performed by Dr. Irvine. Dr. Addison at Crystal Falls, who is associated with the hospital there, provides medical care for some of our employees who request his services.



WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

23. j. MEDICAL SERVICE (CONT'D)

PHYSICAL EXAMINATION OF EMPLOYEES

The Industrial Hygiene Department which is supervised by Dr. George McL. Waldie continues to perform the physical examinations of employees and to counsel with employees regarding physical deficiencies and in such special cases requiring consideration and study. Dr. Bert Moore assists Dr. Waldie.

INDUSTRIAL HYGIENE DEPARTMENT

This department was organized on April 1, 1939 and continues to be under the capable direction of Dr. George McL. Waldie who is assisted by Dr. Bert Moore. As previously stated, the physical examinations of employees are performed in this department. A follow-up program is also carried on in cases where physical examinations reveal an employee to have some deficiency. The records of the Industrial Hygiene Department contain much valuable information regarding the physical condition of all employees.

The Industrial Hygiene Department furnishes the same services to employees of the Inland Steel Company and the North Range Mining Company on the Marquette and Menominee Ranges, as well as to employees of Jones & Laughlin Ore Company.

Up until 1945, all x-ray films were sent to Saranac for reading and interpretation. The Saranac contract was not renewed at that time. Since the fall of 1945, x-ray films have been read and interpreted by Dr. Waldie.

Dr. Waldie submits monthly reports and periodic reports covering the work in this department.

The total of examinations made through December, 1953 is as follows:

	<u>1953</u>	<u>Total</u>
The Cleveland-Cliffs Iron Co.	1,844	21,130
Negaunee Mine	119	4,098
Mather Mine, "A" Shaft	738	4,211
Mather Mine, "B" Shaft	677	1,894
Athens Mine	328	4,408
C. P. & L. Co.	70	961
Land Department		49
Inland Steel Co.	231	5,032
Pickands Mather		149
Jones & Laughlin Ore Co.	131	265
Oliver Iron Mining Co.		725
Marquette County Road Commission		10
Hercules Powder Co.		391
Humboldt Mine	36	52
Other Companies - Miscellaneous	<u>          </u>	<u>3,118</u>
TOTAL	4,174	46,493

WELFARE DEPT. ANNUAL REPORT YEAR 1953

23.  
k. COMMUNITY HEALTH

We are pleased to report that general health conditions in Marquette County in 1953 were very good, there being no serious epidemics or loss of time at the mines because of illness.

Each of the three cities in Marquette County employ a health officer and a full time school nurse. The City of Marquette also has a full time nurse whose services are available mostly to township districts. The townships also have health officers.

City health officers in Marquette County are:

W. A. Corcoran, M. D. - Ishpeming  
R. L. Paine, M. D. - Negaunee  
A. L. Swinton, M. D. - Marquette

The Northern Michigan Children's Clinic at Marquette, operated in connection with St. Luke's Hospital and supported largely by funds from the Michigan Children's Fund, continues to serve children throughout the Northern Peninsula. The Superintendent of the Welfare Department continues to serve as a member of the Board of Directors of Northern Michigan Children's Clinic, Inc.

A large group of children from the various counties of the Northern Peninsula attended the Bay Cliff Health Camp at Big Bay during the summer of 1953, this being the eighteenth year of camp. The camp period is of approximately seven weeks' duration during which time special attention is rendered the different cases such as convalescent cases of poliomyelitis, cardiac cases, rheumatic hearts, speech and hearing defects, diabetics, and undernourished children. The Superintendent of the Welfare Department is Chairman of the Board of Directors of Bay Cliff Health Camp.

23.  
m. RELIEF WORK

Our usual program of extending assistance to special cases was carried on during 1953.



WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

23. m. RELIEF WORK (CONT'D)

The following is a statement of assistance rendered in 1953. This statement does not include cash assistance.

	<u>Princeton</u>	<u>Ishpeming</u>	<u>Negaunee</u>	<u>Total</u>
January	25.00		91.51	116.51
February		15.00	15.00	30.00
March			5.60	5.60
April			36.20	36.20
May		25.00	6.00	31.00
June	20.00		76.20	96.20
July			6.00	6.00
August		27.36	36.20	63.56
September		42.24	6.20	48.44
October	-	-	-	-
November		15.00	6.20	21.20
December			6.00	6.00
	-----	-----	-----	-----
TOTAL	\$ 45.00	\$ 124.60	\$ 291.11	\$ 460.71

n. EMPLOYMENT

The Welfare Department keeps in contact with the Employment Office which is under the supervision of Mr. H. W. Sundberg. When a question arises regarding the employment of a certain individual, the case is reviewed and discussed. Every attempt is made to protect the best interests of the Company in connection with employment.

q. IMPROVEMENT WORK

Mr. Peter Derocher succeeded Mr. Julian Payen who was in charge of our program of improvement of grounds. Mr. Payen will retire May 1, 1954. Since Mr. Derocher has had several years of experience under the supervision of Mr. Payen, he is qualified and capable of filling this position.

s. COMMUNITY SERVICE WORK

As mentioned in previous annual reports, the American Legion building in Negaunee is leased from our Company. We continue to keep the building in good condition and inspections are made regularly. Many community activities are held in the Negaunee Legion Clubhouse.

A large number of fraternal organizations are supported by the people of this community. Many of these fraternal orders maintain their own clubrooms and much of the activity of the community is centered around these organizations.

WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

23.    o.    INCAPACITATED EMPLOYEES (DONATION PAYROLL)

During the year payments were continued to certain men who did not have sufficient service to bring them within the provisions of the Pension Plan of 1/1/1909 but whose cases had merit and to other men who retired under Social Security but had so little employment under that system that their benefits were inadequate. These payments were made over the Donation Payroll. Some of these men were totally disabled through mine accidents while others became incapacitated from illness or disease and required assistance because of large families. There have been very few additions to the payroll over the past few years, and the payroll is employed now only to take care of very unusual cases.

On February 1, 1947 direct relief in the form of grocery, clothing, and fuel orders were discontinued as a regular practice, and allowances over the Donation Payroll were granted in their place. At the close of 1953 only one such recipient - Mrs. Johanna Forstrom - remains on the payroll.

Two Donation Payrolls are prepared, one for the Mining Department and the other for the Holmes Mine Department. On July 1, 1953 the one remaining pensioner - Martin Trondson - was transferred from the Holmes Mine Department Donation Payroll to the Mining Department Donation Payroll for future payment, thereby reducing the active Donation Payrolls to one.

The Mining Department Donation Payroll included 17 people on January 1, 1953 and on December 31, 1953 there were 14 payees, a net loss of three. The total expenditure over this payroll for the year was \$5,308.80.

The following addition was made to the Mining Department Donation Payroll during the year:

Martin Trondson	Monthly allowance - \$20.00	Effective 7/1/1953
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The following were dropped from the payroll of the Mining Department:

Hilma Maunula	Monthly allowance - \$20.00	Died 1/22/1953
Michael Denofre	"        "        \$30.00	"    3/4/1953
Toivo H. Bergstrom	"        "        \$30.00	Dropped 5/31/53 - reemployed.
William Stanaway	"        "        \$30.00	"    6/30/53 - transferred to Retirement Payroll

The Holmes Mine Department Donation Payroll became inactive on June 30, 1953 when its last payee - Martin Trondson - was transferred to the Mining Department Donation Payroll for future payment. A total of \$120.00 was expended over this payroll during the year. This payroll will remain inactive. During its active years - January 1932 through June 1953 - a total of \$18,920.92 was expended over the Holmes Mine Department Donation Payroll.



WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

23.

o. INCAPACITATED EMPLOYEES (DONATION PAYROLL) (Continued)

After being granted, the Furnace Department donations were paid originally by the Furnace Department itself and later by the Cliffs-Dow Chemical Company. By direction from Cleveland on September 1, 1937 the donations were paid by this office over the Furnace Department Donation Payroll. The payroll became inactive in August 1950 with the death of its last payee, and it will remain inactive. During its active years - September 1937 through August 1950 - a total expenditure of \$11,910.00 was made over the Furnace Department Donation Payroll.

The Mesaba-Cliffs Mining Company Donation Payroll remained inactive during the year. The last payment over this payroll was made in March 1948. From the date of origin, January 1, 1946, through March 1948 a total expenditure of \$795.00 was made over The Mesaba-Cliffs Mining Company Donation Payroll.

There are four widows receiving Donation payments, all on the Mining Department Payroll. Two of these widows, Mrs. J. H. Tregoning and Mrs. Fiina Kampinen, have been granted regular donations; one, Mrs. Johanna Forstrom appears on the payroll because of the conversion of direct aid orders to monetary allowances; and one, Mrs. Lyda M.G. Turgeon, is being paid over this payroll rather than under the Pension Plan of 3/1/1950.

Amount of Mining Department Donations (including widows)	\$5,308.80
Amount of Holmes Mine Donations	<u>120.00</u>
	\$5,428.80

WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

23.

u. OUTDOOR ACTIVITIES

Outdoor activities remain to be of great interest to this community. The Winter Sports Club, which maintains a clubhouse and skiing area north of Ishpeming, is a popular organization. The activities which are carried on at this area each winter draw interest and support from local people as well as from people of other parts of the country. The Winter Sports Club area is also used as a picnic ground during the summer and many outdoor meetings are held there.

The 66th Annual Ski Tournament of the Ishpeming Ski Club was held on February 22, 1953. Each year the enthusiasm for our annual ski tournament seems to increase. Several of our employees participate in the ski jumping.

v. THE MATHER INN

The Mather Inn, the most popular hotel in the Northern Peninsula, continues to provide fine service to the public. Each year its popularity increases and during 1953 many more civic and community organizations held their meetings in the different lounges of The Mather Inn.

w. VARIOUS DEPARTMENTS AND ACTIVITIES

The Superintendent of the Welfare Department was elected as President of The Michigan Society for Crippled Children and Adults, Inc. He serves as Vice President of The Michigan Tuberculosis Association. In April of 1953, the Superintendent of the Welfare Department was elected as a member of the State Board of Education, the six-year term beginning July 1. In June of 1953, the honorary degree of L. L. D. was conferred upon him by Northern Michigan College of Education at Marquette, Michigan.

The Superintendent of the Welfare Department continues to act as Chairman of the Board of Directors of Bay Cliff Health Camp at Big Bay, Michigan. He is also a member of the Advisory Consultant Staff to the State Department of Public Instruction on community planning and programming.

The employees of the Central Office held their annual Christmas Party on December 23, 1953.

x. POLICE DEPARTMENT

The Police Department is under the supervision of the Superintendent of the Welfare Department and is in direct charge of Mr. R. J. Veale, Chief. As previously mentioned in this annual report, Mr. Emil Hoff is working with Mr. Veale in order to familiarize himself with the functions of the department. Present plans are that Mr. Hoff will succeed Mr. Veale upon his retirement. Conferences regarding police work and plant protection are often held with Mr. Veale. A monthly report is submitted by Mr. Veale. We feel that our police force furnishes efficient service to the Company and its employees. New men are carefully selected for this department.



WELFARE DEPT.      ANNUAL REPORT      YEAR 1953

APPRECIATION

As Superintendent of the Welfare Department, I wish to express my appreciation for the cooperation, the guidance, and the understanding which has been given this Department by Mr. C. W. Allen, Vice President, former General Manager; Mr. Grover J. Holt, General Manager; Mr. F. J. Haller, former Manager of Michigan Mines; and Mr. J. S. Westwater, Manager of Michigan Mines.

The fine cooperation from Mr. A. J. Stromquist, Safety Director, and his staff is also appreciated.

We shall make every effort to maintain cooperation and efficiency within this Department and with those departments closely associated with it.

Ishpeming, Michigan  
February 23, 1954

Mr. Grover J. Holt  
General Manager  
Building

Dear Sir:

The annual report of the Geological Department for the year ending December 31, 1953 is in the final stage of preparation. Since I shall be on vacation when it is completed, I am preparing this letter of transmittal which will be attached to the report as handed to you.

Following the extensive expansion of the activities of the Department the past two years, the year 1953 may be considered as having followed a more normal pattern, - particularly in the field. In the case of the operating mines, the Humboldt property required more constant geological attention and the Republic assumed increasing importance with the Department. A sizable increase in paper work developed as a result of more frequent reviews of the budget, the long range estimate of ore reserves and, especially, the preparation of the so-called Capital Regeneration Study.

To me the most important event in the Company's exploration program during the year was the indication, from current diamond drilling, that the so-called Empire Area in Section 19, 47-26 and adjoining territory contains a very large tonnage of oxidized iron formation in which the iron is contained chiefly as magnetite and which may be concentrated, magnetically, to a high grade product at a reasonable fineness of grind. If continued drilling shows this indication to be consistent, it will mean a very bright future for the Company in the iron ore concentrating field.

Although, in my opinion, direct shipping ores will continue to be an asset on account of the comparatively lower capital investment to develop them, the so-called iron ore "pellet", formed by agglomerating fine-grained concentrates, will become increasingly in greater demand with the years. Until this Empire exploration was started, drilling of large Company areas, formerly considered promising, has demonstrated the extreme fineness of the iron oxide particles in most areas, thus indicating questionable economic reserves as of the present. Of course, exceptions to this are the Humboldt and Republic properties but which have relatively limited reserves.

The principal activity in the geophysical field during 1953 was the field research conducted during August to November, inclusive, using a new technique developed in Canada called the "Electromagnetic Induction Method"



Mr. Grover J. Holt

February 23, 1954

of exploration. This method consists of setting up an electromagnetic field, by induction, at a high frequency. The magnetic waves, in passing through the ground, are deflected in varying amounts by varying rock structures making it possible, by interpretation, to locate certain contacts and the position and relative trends of iron formation. It is too early yet to evaluate the relative importance of this technique as compared with other geophysical methods. Studies were made at several points in the Marquette Range, on the Vermilion Range, and in the vicinity of the Company's Cushing Mine at the West end of the Mesaba Range. The work done was under the direct supervision of the Canadians who developed the technique but our own staff was trained simultaneously. The work planned for the coming season will demonstrate more clearly its value to the Company but we do think it does have considerable promise.

A modest field reconnaissance program was continued on the Vermilion Range during the summer. At least one area indicates some promise, - in Section 5, 62-14, - but generally the results have been negative. It is expected that the work planned for the coming summer will determine, definitely, whether additional activities are warranted.

The continued intensive exploration by the wholly owned Guayana Company at El Trueno in Venezuela proved a large body of high grade direct shipping ore which could be mined by open pit. Extensive studies made of the transportation problem to get this ore to market, however, and the inability to interest partners in the venture, resulted in cancelling the option to purchase and the complete abandonment of the project as of December 31, 1953.

Numerous land offers were submitted to the Company during the year in areas outside of the Lake Superior District as follows:

Alabama	North Carolina
Canada	Virginia
Kentucky	Wyoming
Montana	

The only examinations and field work conducted, however, were in the Canadian field. The principal activity was contained in the exploration campaign conducted during the summer in the so-called Mistassini District of Quebec under the direct supervision of Dr. M. W. Bartley, Manager of Canadian Cliffs, Ltd. A comparatively large number of claims were staked in the so-called Temiscamie, Alanel, and Sandspit areas. Diamond drilling was done on the Temiscamie group with moderate promise. The Alanel and Sandspit areas, however, indicate from surface sampling, a large reserve of magnetic iron formation which may be concentrated at a reasonable grind. It is planned to continue exploring this area, both by field parties and diamond drilling, during the coming season.

The personnel of the Department experienced minor changes during the year as follows:

Messrs. Harold C. Boback and Robert H. Mount were engaged as geologists.

Mr. Grover J. Holt

-3-

February 23, 1954

Mr. Layton C. Binon was transferred from operating engineer at Mather Mine "B" Shaft to the Department in his former capacity as geologist.

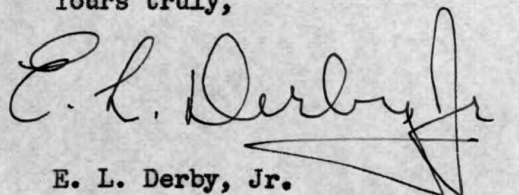
Donald R. Nankervis was engaged as a draftsman.

Miss Betty C. Morris was engaged as a stenographer; however, she spends a great deal of her time recording drill records, etc.

TABLE I in the report tabulates in detail the personnel of all branches of the Department and the turnover which has occurred.

I wish to record here my appreciation of the enthusiastic cooperation I have received throughout the year from Messrs. Sundeen and Boyum as well as all members of the Department and its branches, including the Diamond Drilling Department under the direction of Mr. Rembold. In many respects the year 1953 was another important period in the history of the Department.

Yours truly,



E. L. Derby, Jr.  
Chief Geologist

ELD:DES



REPORT OF GEOLOGICAL DEPARTMENT FOR YEAR  
ENDING DECEMBER 31, 1953

The following is a report of the Geological Department for the year 1953:

CONTENTS

- I. Staff
- II. Geological and Geophysical Field Work
- III. Exploration Drilling Department
- IV. Surface Exploration
- V. Underground Exploration
- VI. Land Offers and Outside Explorations
- VII. Other Departmental Highlights

This report has been prepared through the cooperative efforts of each of the staff members. The geologist in charge of each project prepared the summary of his assignment. The editorial board consisted of Gerald J. Anderson, Eric J. Rex, H. Walter Rembold and Burton H. Boyum.

I. STAFF

A. Distribution

As in the past, Ishpeming continued to be the headquarters and base from which the Geological Department operated. During the year the Company's staff remained about the same as in 1952, and exploration activity continued at a rapid pace. Tables I, II, and III show the distribution of staff members.

TABLE I

E. L. Derby, Jr., Chief Geologist  
 Burton H. Boyum, Assistant Chief Geologist

EXPLORATION DRILLING DEPARTMENT

H. Walter Rembold, Sup't. (A)  
 Kenneth G. Maikkula, Drilling Engineer (B)  
 Edwin Jacka, Foreman  
 Swante Merrila, Foreman  
 Carl Ostlund, Foreman  
 Eino O. Kujala, Diamond Drill Clerk  
 Raymond A. Leverton, Ass't. Clerk

GEOLOGISTS

Gerald J. Anderson  
 Robert M. Becker  
 David M. Bennett  
 Layton C. Binon  
 Rolland L. Blake (C)  
 Harold C. Boback (D)  
 Donald L. Gilbert  
 James P. Meyers  
 Robert H. Mount (E)  
 Charles R. Pace, Jr.  
 Joseph L. Patrick  
 E. Richard Randolph  
 Eric J. Rex

TECHNICIANS

George M. Olson, Chief  
 Robert W. Ryan  
 Sidney T. Holman

DRAFTSMEN

Archie Minnear  
 Pat S. Johnson  
 John V. Larson  
 Donald Nankervis (F)

SECRETARIAL

Mrs. Belle Bloch, Office Secretary  
 Miss Dora Swanson, Secretary to  
 Messrs. Derby, Sundeen, & Campbell  
 Douglas K. Pohlman  
 Betty C. Morris (G)

MISCROSCOPY

Tsu Ming Han (H)

CONSULTANTS

Prof. William A. Longacre, Geophysics  
 Dr. Melville W. Bartley, Geology, Canada  
 Dr. J. M. Neilson, Consultant

MICHIGAN FIELD ASSISTANTS, TEMPORARY

Ted Engel, Jr., Geologist  
 David M. Knowles, Geologist  
 Norbert O'Hara, Geologist

MINNESOTA FIELD ASSISTANTS, TEMPORARY

Charles B. Archambeau, Compassman  
 Charles L. Elliot, Geophysicist  
 Bruno J. Haas, Geologist  
 Roger M. Hill, Compassman

- (A) Called to Venezuela in May to supervise the El Trueno Exploration.  
 (B) Joined permanent staff as Drilling Engineer January 1, 1953.  
 (C) Geologist for Minnesota properties.  
 (D) 5-1-53 joined permanent staff as Geologist.  
 (E) 5-1-53 joined permanent staff as Geologist.  
 (F) 5-15-53 transferred from Engineering Department to Geology Department.  
 (G) 2-2-53 joined permanent staff as Stenographer.  
 (H) 4-15-53 joined permanent staff as Microscopist shared with Metallurgical Department.



B. Man-Hour Summary

The following Table II is the hourly rate personnel carried on the General Storehouse payroll as members of the Exploration Drilling Department:

TABLE II

DISPOSITION OF HOURLY RATE PERSONNEL  
GENERAL STOREHOUSE PAYROLL

Total Days Worked (5 Day Week)	- 255
Saturdays & Sundays	- 104
Holidays	- 6
Days Lost to Strike, etc.	- 0
Total	365

Description	Total No. of Men	New Hire	Separa- tions	Total Hours Worked	Statist- ical Men	Labor Cost
Runners	20	0	1	38,656.75	18.92	\$ 81,455.30
Helpers	21	9	11	40,041.25	19.65	72,849.95
Recorder	1	0	0	1,992.00	.98	4,093.16
Total	42	9	12	80,690.00	39.55	\$158,398.41

Table III shown below is a recapitulation of the various components of the Geological staff:

TABLE III

MAN-HOUR SUMMARYMICHIGAN

<u>Exploration Drilling Department*</u>	<u>Hours</u>	<u>Men</u>
Labor	80,690	42
Supervisors	10,992	5
Sub-Total	91,682	47
<u>Geological Department</u>		
Permanent	47,499	23
Temporary	1,448	3
Sub-Total	48,947	26

\*Exclusive of mine employed personnel and drill contractors.

MINNESOTA

Permanent	2,076	1
Temporary	2,183	6
Sub-Total	4,259	7

The following tabulation, Table IV, shows the distribution of the professional members of the Geological Department by projects, as of the end of the year.

TABLE IV  
DISTRIBUTION OF PROFESSIONAL GEOLOGICAL STAFF  
AS OF DECEMBER 31, 1953

MICHIGAN

Operating Mines

Athens-----	Joseph L. Patrick
Bunker Hill-----	" " "
Cambria-Jackson-----	Layton C. Binon
Cliffs-Shaft-----	Robert M. Becker & James P. Meyers
Lloyd-----	David M. Bennett
Maas-----	Layton C. Binon
Mather Mine "A" Shaft-----	Donald L. Gilbert
Mather Mine "B" Shaft-----	Charles R. Pace, Jr.
Humboldt-----	Robert H. Mount
Ohio-----	Harold C. Boback
Republic-----	" " "
Spies-----	David M. Bennett
Tilden-----	E. Richard Randolph

Exploration Projects

Allen Exploration-----	David M. Bennett
Cascade-----	E. Richard Randolph
Cascade East-End-----	" " "
Central Basin - Lowmoor-----	Joseph L. Patrick
Empire-----	E. Richard Randolph
Grossbusch-----	David M. Bennett
Imperial-----	Harold C. Boback
McColeman-----	David M. Bennett
McGillis-----	" " "
McDermott-----	" " "
Michigamme-----	Harold C. Boback
North Lake Project-----	E. Richard Randolph
Perkins-----	" " "
Pioneer & Arctic-----	Layton C. Binon
Sec. 4, 47-27 - Deep Ore-----	E. Richard Randolph
Sec. 11, 47-27 " "-----	" " "
Titan-----	Harold C. Boback

MINNESOTA - GENERAL

E. L. Derby, Jr.  
B. H. Boyum  
Rolland L. Blake (resident)

CANADIAN CLIFFS LTD.

Dr. M. W. Bartley, Resident Manager

CANADA - GENERAL

E. L. Derby, Jr.  
B. H. Boyum  
E. J. Rex

VENEZUELA - GENERAL

G. J. Anderson  
E. J. Rex  
H. W. Rembold

U.S. GENERAL

E. L. Derby, Jr.  
E. J. Rex



### C. GENERAL SUMMARY

The department employed a total of 15 professional geologists, including Messrs. Derby and Boyum, for part or all of 1953. At the end of 1953, we had a net of 13 permanent staff members; three more than at the end of 1952.

Our staff was increased by one draftsman. In Michigan, we had 3 two-man field parties, in Minnesota, we had 3 field parties, and in Canada, we had 9 field parties and 3 prospecting parties.

Virtually no time was devoted to the examination of U. S. General Land Offers.

Our Venezuela exploration was the largest single project conducted by the Department during the year 1953. Drilling commenced in January and was carried out until the latter part of September. In addition to the drilling, tunneling, mapping and sampling was conducted. At the year's end, the exploration option was relinquished and the Guayana Company dissolved. This exploration proved the largest single deposit of iron ore ever found by the Company and, to the best of our knowledge, at the lowest cost per ton of ore found.

## II. GEOLOGICAL & GEOPHYSICAL FIELD WORK

As in previous years, our field work has been done by two-man parties. One member acted as the geologist and the other as the compassman, or with one member as the geophysicist and the other as the notekeeper. In general the reconnaissance work was done with sundial compass survey lines, together with the mapping of outcrops, dumps and pits, the sampling of iron-formation, and the collecting of representative hand specimens of various rock types encountered.

This Section II is sub-divided into five principal areas in which geological and geophysical field work has been done.

### A. Michigan

We employed 3 two-man field parties in Michigan during the summer of 1953

#### 1. Cascade District - E. Richard Randolph, Geologist

a. Richmond Area - Crew #1 worked 6 weeks in the Cascade East End Basin. Figure 1 shows the location of the field work and the following table shows its distribution:

	<u>Miles</u>	<u>Hours</u>	<u>Amount</u>
Surveying	5	220	\$ 926.29
Mapping & Sampling	5	150	610.82
Magnetic Prospecting	7 3/4	110	470.65
E. M. Traverses	1/2	24	106.57
Total		504	\$2,114.33

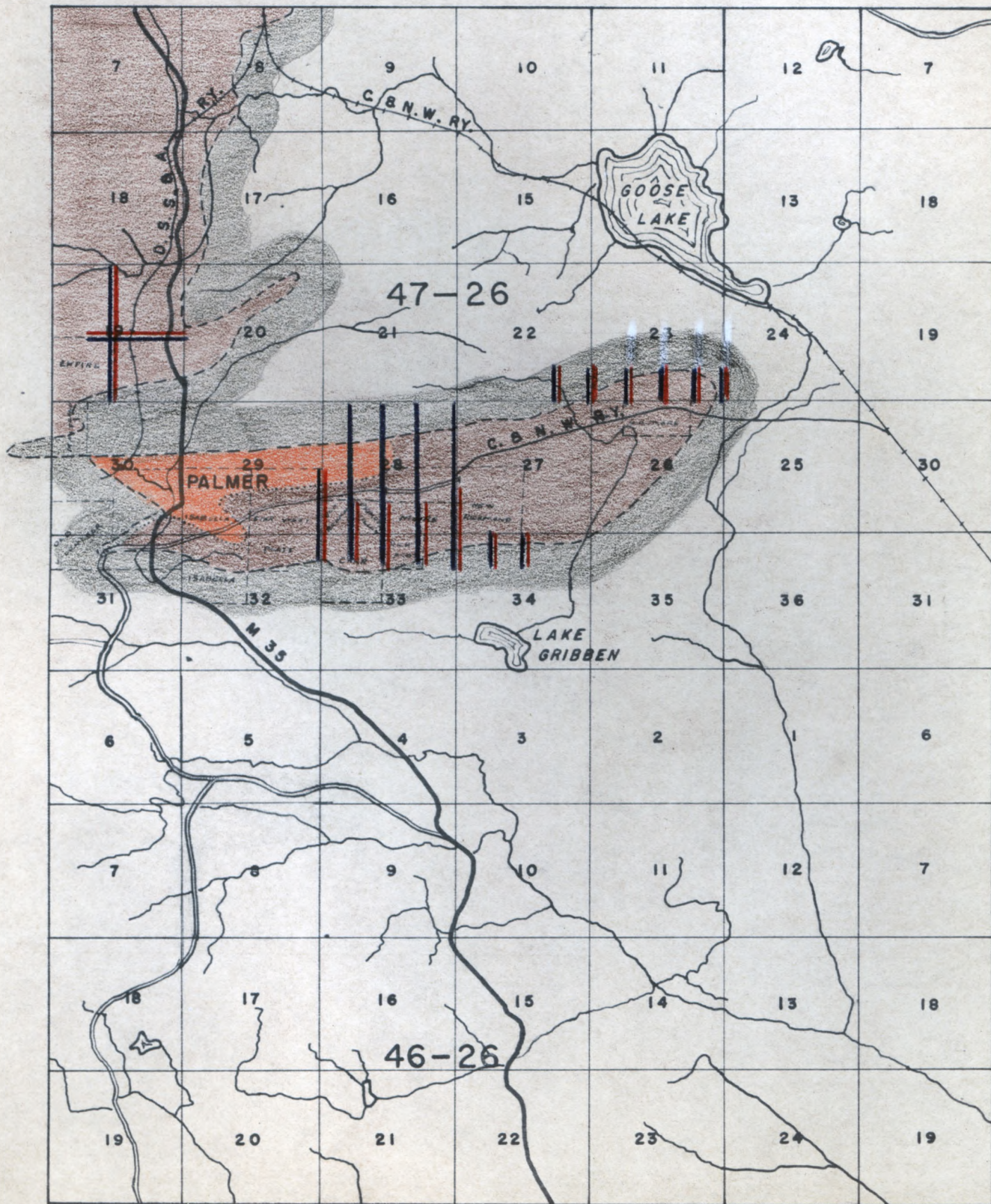


Figure 1

# CASCADE EXPLORATION

*Red Geological Surveying & Mapping*

*Blue Geophysical Prospecting*





Geological field work was completed in this area. It is planned to continue this exploration by diamond drilling in 1954, and possibly supplemental electromagnetic work.

b. Empire Area - Upon completion of the field work in the Richmond Area, crew #1 moved into the Empire Area to do additional field work of mapping and sampling. The following table shows the distribution of this field work:

	<u>Miles</u>	<u>Hours</u>	<u>Amount</u>
Surveying	1 3/4	80	\$ 102.33
Mapping & Sampling	1 3/4	50	72.93
Magnetic Prospecting	<u>1 3/4</u>	<u>30</u>	<u>59.49</u>
Total		160	\$ 234.75

2. Central Basin District - Joseph L. Patrick, Geologist

The Central Basin project consists of the area in the Humboldt District east of the Humboldt Mine and extends eastward into the North Lake-Saginaw District to the West line of Sections 2, 11, 14, and 23 of T. 47 N., R. 28 W.

The work for 1953 was a continuation of that which had been started during 1952. The geophysical traverses were completed on the lines, which were surveyed and mapped in the 1952 field season. In 1953 the preliminary survey of the area was completed. The mapping and geophysical prospecting was extended westward to the Humboldt Mine.

	<u>Miles</u>	<u>Hours</u>	<u>Amount</u>
Surveying	14	493	\$ 961.35
Mapping & Sampling	14	453	896.56
Geophysics (Magnetics)	<u>31</u>	<u>634</u>	<u>1,389.67</u>
Total		1,584	\$3,247.58

The geological work in general was in an area of few outcrops. The geophysical work has shown the position of the Greenwood iron-formation and also indicates that the Negaunee iron-formation is continuous along the south limb with possible displacement, northward, in the area south-east of Lake Lory.

3. North Jackson Project - Charles R. Pace, Geologist

Field work was carried out in the North Jackson Pits (Sec. 1, 47-27) during the summer months. Since Mather Mine "B" Shaft will eventually undermine a portion of these pits, it was decided to conduct an investigation as to the feasibility of an open pit operation in this area before it is undermined. The summer work consisted of detailed geologic mapping and metallurgical testing of the pits and adjacent outcrops found north of the monument. The area which extends east of the monument had previously been sampled but not mapped.

Crews varying from two to six men worked in the area from the middle of August to the middle of September and were able to complete the assigned work.



Figure 2

## CENTRAL BASIN EXPLORATION

Red - Geological Surveying & Mapping  
 Blue - Geophysical Prospecting

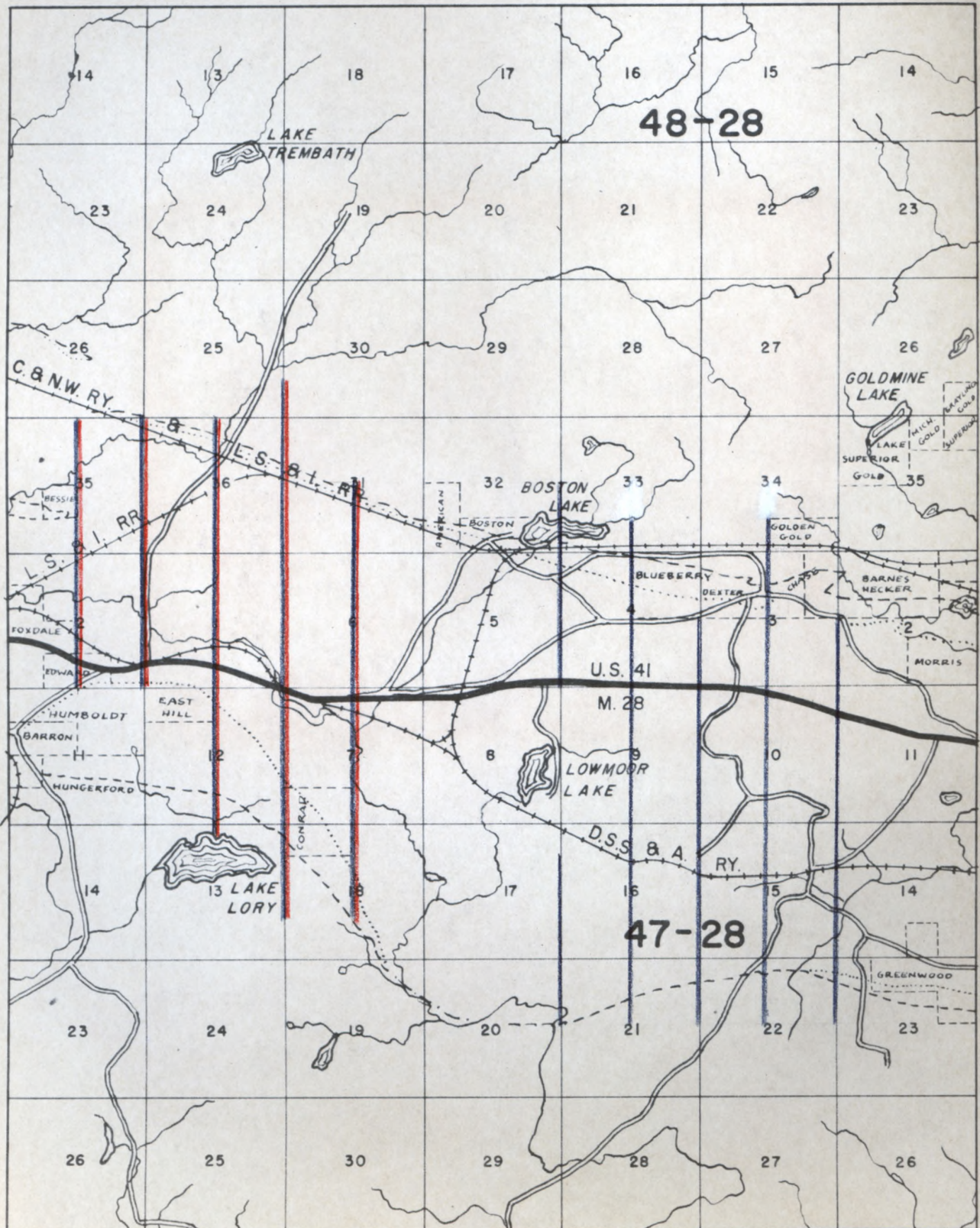




Figure 3



North Jackson Exploration  
Mather Mine, "B" Shaft - Section I, 47-27  
View of Field Crew conducting Plane Table Mapping and sampling

The mapping was done with plane table and alidade at the scale of 1" = 50'. The work was carried out from two base lines laid out so that all pits and outcrops could be surveyed by orienting along these lines.

The sampling was laid out systematically and a total of thirty-four samples were taken. The previous sample letters of N. J. (North-Jackson) were continued and advanced from N.J. 99 to N.J. 133.

A report and estimate will be completed in 1954. The surface complications, previous mining, and varying quality of the material make it questionable at present as to the final decision.

	<u>Hours</u>	<u>Amount</u>
Mapping and Sampling	777	\$ 1,741.05

4. IRON RIVER DISTRICT, David M. Bennett, Geologist

a. McDermott Exploration - Since there are no outcrops in this area, the exploration was confined to seismic prospecting to determine the depth of overburden. This work was done in May. In general the ledge varied from 120' to 180' in depth. The following table shows the distribution of the field work:

	<u>Miles</u>	<u>Hours</u>	<u>Amount</u>
Surveying	1.0	208	\$ 466.02
Geophysics Seismic	<u>.87</u>	22	<u>340.15</u>
Total		230	\$ 806.17

b. McColeman Exploration - L. O. 3400 - In September the Company resumed examination of the old McColeman property near Gibbs City west of Iron River. The principal exploration activity consisted of electromagnetic prospecting. This work indicated a zone to the southeast of the old workings and it is suggested that core drilling be done to determine the anomaly. The following table shows the distribution of the field work:

	<u>Miles</u>	<u>Hours</u>	<u>Amount</u>
Surveying	2.3	13	\$ 214.82
Geophysics (E.M)	<u>1.2</u>	14	<u>225.00</u>
Total		27	\$ 439.82

c. Allen Exploration - This is also an area of no outcrops. Exploration was confined to electromagnetic prospecting prior to drilling. The following table shows the distribution of the field work:

	<u>Miles</u>	<u>Hours</u>	<u>Amount</u>
Surveying	1.0	36	\$ 573.91
Geophysics (E.M.)	<u>1.5</u>	9	<u>138.14</u>
Total		45	\$ 712.05





Geologic mapping and ground magnetics located the iron-formation in these four forties. Of the 21 ore samples collected, 1/3 were concentratable, 1/3 were possibly concentratable, and 1/3 were not concentratable. Preliminary exploration results indicate that further exploration is warranted on this land offer.

c. L. O. 2914 (E and A cc-548 - Drilling) - Land Offer 2914 State Units on the Vermilion, consisted of 7 units which were awarded as prospecting permits on August 18, 1952. (See Fig. 4). One diamond drill hole tested the magnetic cherty iron-formation in Sec. 22, 61-14. The results showed that the iron-formation was interbedded with greenstone, and that it was too lean, required very fine grinding for liberation, and had low recovery values.

During the summer, 2 days of geologic mapping were done along the magnetic profiles in Sec. 16, 61-14. The greenstone was here found to contain lenses of magnetic cherty iron-formation which looked like that from the drill hole.

The results of the drilling and geologic mapping, indicated that further exploration was not warranted, so this land offer was abandoned.

## 2. Mesaba Range

a. Cushing Reserve - The Cushing Reserve, just west of Coleraine, Minnesota, was partly explored this year by both resistivity and electromagnetic induction geophysical techniques. The work was mainly research to determine if these techniques were applicable to Mesaba-type ore bodies.

The resistivity work was done in conjunction with Mike Walle, Chief Research Engineer, State Division of Lands and Minerals. The results of the four days of working, using a 4-or-5-man crew, indicate that this technique may have application to ore bodies of the Mesaba-type.

The induction work was done during 3-1/2 days, using a 2-man crew. The results indicated the location of the south contact of the Biwabik iron-formation with the Virginia Slate under considerable drift. There is also a possibility that the results can show the limits of concentrating material when correlated with drilling and metallurgical test work.

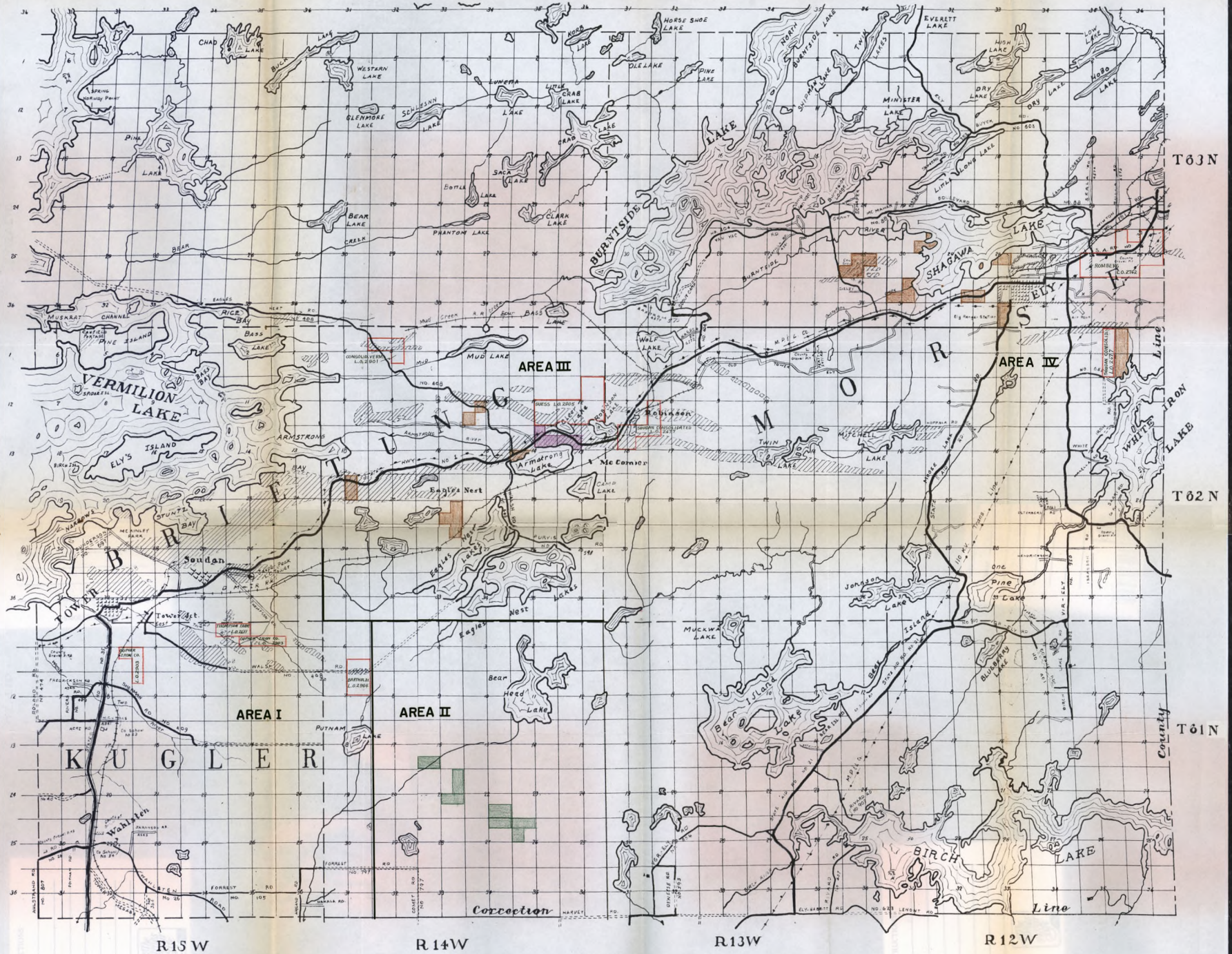
b. Western Mesaba - During the year considerable interest was focussed on possible open lands on the western Mesaba Range lying west of Coloraine. Exploration data was gathered and land ownerships checked. We also followed the work done by Mr. David White of the Minnesota Geological Survey. Mr. White's study has been a doctorate thesis on the lithology and structure of the Mesaba Range.

C. United States General - Section VI of this Annual Report covers the general subject of Land Offers and Outside Explorations. During 1953, a total of six mineral land offers throughout the United States, excepting Michigan and Minnesota, were brought to the attention of the Department, see Fig. 5.

None of these land offers were examined in the field by the Geological Department.



VERMILION RANGE - MINNESOTA



1953 LAND OFFERS

- AS MARKED
- L.O. 2914 - STATE UNITS
- L.O. 2906 - MC COMBER MINE
- L.O. 2780 - CONAN - PATTISON & HIGGINS

KNOWN SOUDAN 1 - FM. (FROM PLATE VI., MONO. 52)

FIG. 4

SCALE - 1" = 1 MILE



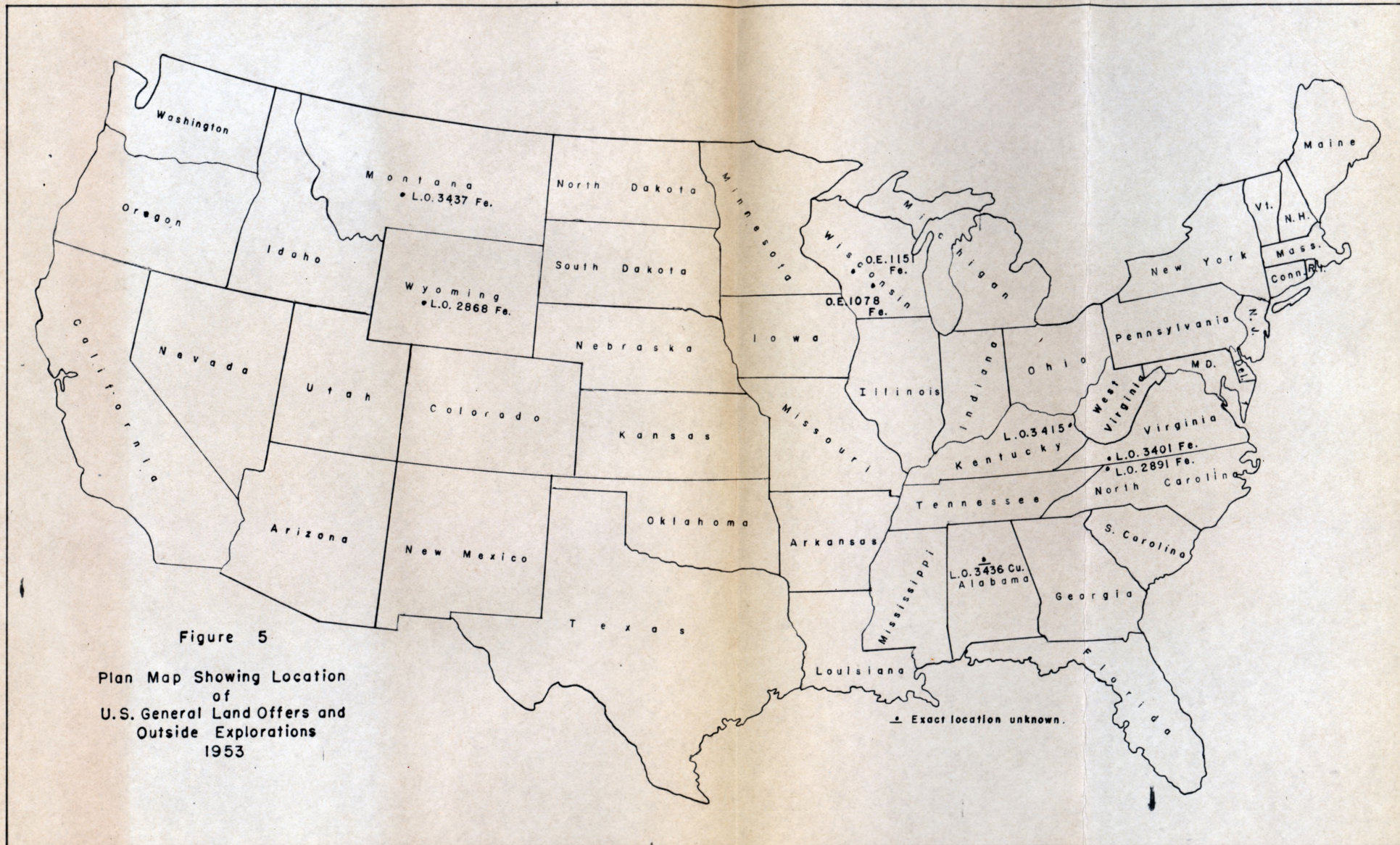


Figure 5

Plan Map Showing Location  
of  
U.S. General Land Offers and  
Outside Explorations  
1953



1. Alabama - Land Offer 3436, of undetermined location in Alabama, is a deposit of copper mineralization in limestone. As the Company is not interested in a copper producing property, it was declined.

2. Kentucky - Land Offer 3415, iron ore in Lawrence County, Kentucky, was offered for the second time in 1953. Previously (in 1950, and as Land Offer 2615) some correspondence had been received, and answered, concerning this property.

3. Montana - Land Offer 3437, in Meagher County, Montana, was received and is still pending. It is an iron replacement deposit around fissure veins.

4. North Carolina - Land Offer 2891, Ashe County, North Carolina, consists of a series of magnetite lenses. These deposits were considered to require beneficiating. It was felt that the high grade material present was limited in quantity.

Preliminary examination was done by other engineers, the next step being to drill the property. After it was disclosed to the owner that previous budgetary commitments made it impossible for Cliffs to drill the deposits in 1953, the owner indicated he was planning to drill it himself.

5. Virginia - Land Offer 3401, in Grayson County, Virginia, was offered as a high grade iron ore deposit, but because of its location and the nature of terms it was declined.

6. Wyoming - Land Offer 2868, a metallurgical grade iron deposit in Fremont County, Wyoming, was offered, and from all indications is the same as #2836, offered in 1952.

This Land Offer was declined because of its grade, and its location from a marketing standpoint.

#### D. Canada

In addition to the Resident Manager and Chief Clerk, who are retained on an annual basis, Canadian Cliffs engaged Dr. J. M. Neilson as Consultant in charge of exploration in the Province of Quebec. Dr. Neilson supervised the exploration under O.E. 1031, in the Temescamie River - Lake Albanel region of Quebec. During the calendar year 1953, Canadian Cliffs, Ltd. engaged in examination and exploration of various areas and properties throughout Canada.

The exploration was centered in the Provinces of Ontario and Quebec, and examinations of Land Offers were made in the Maritime Provinces, Quebec, Ontario and British Columbia. (For locations of the various land offers and outside explorations see Figure 6)

During the twelve-month period, twenty-two Outside Explorations and seventy Land Offers were included in the program. Only six Outside Explorations were intensely pursued, and only forty-four of the Land Offers were given serious consideration. All the Outside Explorations, except one, have been declined. This Exploration and the twenty-two Land Offers are being carried over to 1954 for consideration and disposal.

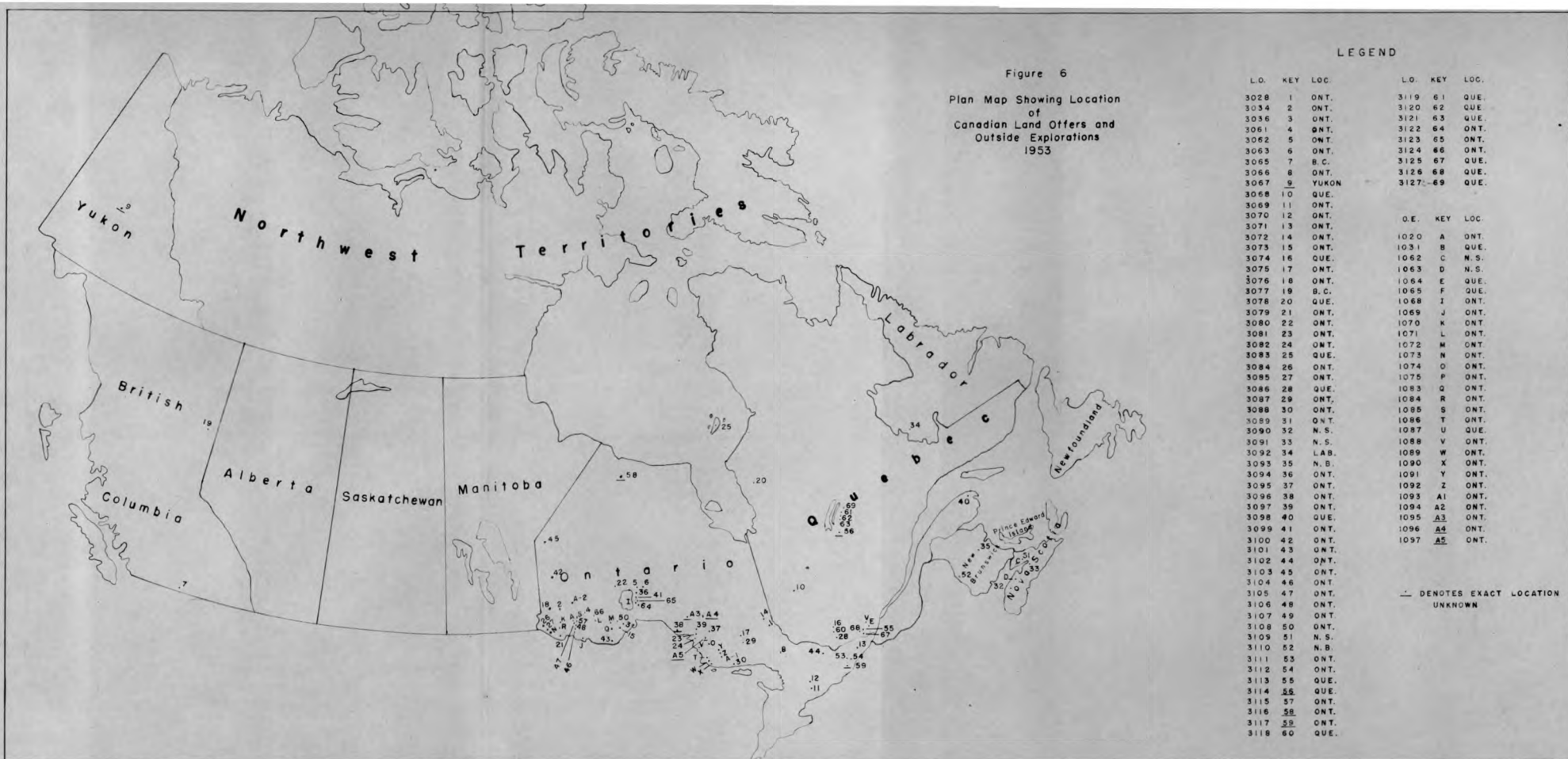


Figure 6  
Plan Map Showing Location  
of  
Canadian Land Offers and  
Outside Explorations  
1953

LEGEND

L.O.	KEY	LOC.	L.O.	KEY	LOC.
3028	1	ONT.	3119	61	QUE.
3034	2	ONT.	3120	62	QUE.
3036	3	ONT.	3121	63	QUE.
3061	4	ONT.	3122	64	ONT.
3062	5	ONT.	3123	65	ONT.
3063	6	ONT.	3124	66	ONT.
3065	7	B.C.	3125	67	QUE.
3066	8	ONT.	3126	68	QUE.
3067	9	YUKON	3127	69	QUE.
3068	10	QUE.			
3069	11	ONT.			
3070	12	ONT.			
3071	13	ONT.	O.E.	KEY	LOC.
3072	14	ONT.	1020	A	ONT.
3073	15	ONT.	1031	B	QUE.
3074	16	QUE.	1062	C	N.S.
3075	17	ONT.	1063	D	N.S.
3076	18	ONT.	1064	E	QUE.
3077	19	B.C.	1065	F	QUE.
3078	20	QUE.	1068	I	ONT.
3079	21	ONT.	1069	J	ONT.
3080	22	ONT.	1070	K	ONT.
3081	23	ONT.	1071	L	ONT.
3082	24	ONT.	1072	M	ONT.
3083	25	QUE.	1073	N	ONT.
3084	26	ONT.	1074	O	ONT.
3085	27	ONT.	1075	P	ONT.
3086	28	QUE.	1083	Q	ONT.
3087	29	ONT.	1084	R	ONT.
3088	30	ONT.	1085	S	ONT.
3089	31	ONT.	1086	T	ONT.
3090	32	N.S.	1087	U	QUE.
3091	33	N.S.	1088	V	ONT.
3092	34	LAB.	1089	W	ONT.
3093	35	N.S.	1090	X	ONT.
3094	36	ONT.	1091	Y	ONT.
3095	37	ONT.	1092	Z	ONT.
3096	38	ONT.	1093	A1	ONT.
3097	39	ONT.	1094	A2	ONT.
3098	40	QUE.	1095	A3	ONT.
3099	41	ONT.	1096	A4	ONT.
3100	42	ONT.	1097	A5	ONT.
3101	43	ONT.			
3102	44	ONT.			
3103	45	ONT.			
3104	46	ONT.			
3105	47	ONT.			
3106	48	ONT.			
3107	49	ONT.			
3108	50	ONT.			
3109	51	N.S.			
3110	52	N.B.			
3111	53	ONT.			
3112	54	ONT.			
3113	55	QUE.			
3114	56	QUE.			
3115	57	ONT.			
3116	58	ONT.			
3117	59	ONT.			
3118	60	QUE.			

— DENOTES EXACT LOCATION  
UNKNOWN



In addition to the Misstassini project one two-man party prospected elsewhere in Quebec, principally near Roberval.

Two two-man prospecting parties were in the field in the Province of Ontario attempting to discover valuable deposits on Crown Lands on behalf of Canadian Cliffs Ltd.

The prospecting projects were not immediately successful but should be continued in the future.

The total cost of the Canadian Cliffs operation for the year 1953 amounted to \$ 133,371.61.

E. Venezuela

1. El Trueno - Land Offer 2644 (refer to Section IV - D)
2. Capaya - Land Offer 2872

The deposit covered by this land offer was visited in February, 1953 by Mr. Burton H. Boyum, accompanied by Dr. Oswaldo DeSola of MISECA. It is located 116 kms. (70 miles) east of Caracas along an excellent highway. It is also 29 kms. (17 miles) from Capaya to the town of Higuerote on the Caribbean shore. The possible harbor site near Higuerote would be about 20 kms. (12 miles) from the deposit. Four samples collected in February, 1953 averaged 65% iron. The deposit is attractive in that it is located so close to shipping facilities and would be relatively inexpensive to explore.

3. Sorrondo Hill - Land Offer 3418

During the month of September 1953, Messrs. Walter H. Rembold and Kenneth Johnson, while at El Trueno, examined an iron deposit on Sorrondo Hill. This property is located on the south bank of the Orinoco River, approximately 37 kms. downstream, and east of the town of San Felix. This deposit is on a topographic high which would make it easily mined by open pit methods.

Material in this deposit was not of first-class ore grade, but of lean ore and iron-formation with characteristics which it is believed are amenable to concentration by simple and inexpensive methods.

### III. EXPLORATION DRILLING DEPARTMENT

During the year 1953, the Company established the position of "Drilling Engineer" for the Exploration Drilling Department. Donald Staples, assistant diamond drill clerk, was transferred to the machine shop office. Raymond Leverton was employed to take over the duties of the assistant diamond drill clerk, March 1953.

An underground exploration driller leader classification was instituted at the Athens-Bunker Hill Mine and Mather Mine "B" Shaft. Mather Mine "A" Shaft employed an underground diamond drill boss.

Approval was granted in January 1953 for a proposed experimental incentive plan for underground drilling at the Cambria-Jackson Mine. The Industrial Engineering Department formulated additional experimental diamond drilling incentive plans for the Humboldt surface diamond drilling and the Maas Mine underground diamond drilling.

#### 1. Diamond Cost

The following Table V represents an analysis of diamond bit costs at the various locations and the respective hole sizes.

		TABLE V PER FOOT COST OF DIAMOND BITS USED IN 1953													
		<u>EX</u>			<u>AX</u>			<u>BX</u>			<u>NX</u>			Total	Total Bit
<u>PROJECT</u>		Ft.	Amt.	Per Ft.	Ft.	Amt.	Per Ft.	Ft.	Amt.	Per Ft.	Ft.	Amt.	Per Ft.	Footage	Cost
<u>Sec.</u>	<u>Hole</u>														
1	148							171	\$ 760.95	4.45	10	\$ 92.57	9.26	181	\$ 853.52
1	149							91	451.36	4.96	20	145.00	7.25	111	596.36
4	45							1,160	6,507.60	5.61				1,160	6,507.60
5	41							733	1,915.77	2.61				733	1,915.77
5	46				609	\$ 1,394.61	2.29							609	1,394.61
5	49							607	2,421.93	3.99				607	2,421.93
6	90							636	2,696.64	4.24				636	2,696.64
11	20A										2,510	14,131.30	5.63	2,510	14,131.30
11	20B										275	1,702.25	6.19	275	1,702.25
11	20C										353	2,767.52	7.84	353	2,767.52
19	1				419	783.53	1.87	689	1,302.21	1.89				1,108	2,085.74
19	2										1,403	2,441.22	1.74	1,403	2,441.22
19	4							27	32.94	1.22				27	32.94
29	4A										1,990	8,775.90	4.41	1,990	8,775.90
<b>TOTAL FOR SURFACE HOLES</b>					1,028	\$ 2,178.14	2.12	4,114	\$16,089.40	3.91	6,561	\$30,055.76	4.58	11,703	\$ 48,323.30
<b>MINE</b>		<u>UNDERGROUND</u>													
Athens-Bunker Hill		351	\$ 276.92	.79	2,379	\$ 4,357.11	1.83	3,231	\$10,219.80	3.16	606	\$ 1,758.50	2.90	6,567	\$ 16,612.33
Cambria-Jackson					2,017	3,315.34	1.64	1,048	3,905.95	3.73	42	155.39	3.70	3,107	7,376.68
Cliffs-Shaft		6,047	4,455.96	.74										6,047	4,455.96
Humboldt		484	416.24	.86	30	146.05	4.87							514	562.29
Maas					166	177.42	1.07	570	541.50	.95	20	72.40	3.62	756	791.32
*Mather Mine "A" Shaft		358	422.44	1.18	6,251	11,814.39	1.89	3,902	11,979.14	3.07	178	784.98	4.41	10,689	25,000.95
*Mather Mine "B" Shaft					5,586	9,552.06	1.71	5,246	10,859.22	2.07	818	2,871.18	3.51	11,650	23,282.46
Ohio					52	74.61	1.43	598	864.23	1.45	163	796.12	4.88	813	1,734.96
<b>TOTAL FOR UNDERGROUND HOLES</b>		7,240	\$5,571.56	.79	16,481	\$29,436.98	1.79	14,595	\$38,369.84	2.63	1,827	\$6,438.57	3.52	40,143	\$ 79,816.95

\*Footage and costs taken from bits sent to individual mines (footages shown do not take into account what "A" Shaft drilled for "B" Shaft or vice versa).



### 2. Diamond Inventory - Hand Setting

The following Table VI shows the distribution of carbon and ballas bortz for the year 1953:

TABLE VI

DIAMOND INVENTORY (Hand Setting), December 31, 1953

	<u>CARBON (Hand Setting)</u>			<u>BALLAS BORTZ (Hand Setting)</u>		
	<u>Kts.</u>	<u>Amount</u>	<u>Per Kt.</u>	<u>Kts.</u>	<u>Amount</u>	<u>Per Kt.</u>
On Hand 1/1/53	808.24	\$63,629.89	\$78.72	40.89	\$4,077.47	\$99.72
Purchased 1953	--	--	--	--	--	--
<b>TOTAL</b>	<b>808.24</b>	<b>\$63,629.89</b>	<b>\$78.72</b>	<b>40.89</b>	<b>\$4,077.47</b>	<b>\$99.72</b>
Used 1953 (Loss)	--	--	--	--	--	--
On Hand 12/31/53	808.24	\$63,629.89	\$78.72	40.89	\$4,077.47	\$99.72

DISTRIBUTION OF INVENTORY: Loose Carbon, Carbon set in bits, loose Ballas (C. C. I. CO.)

### 3. Diamond Inventory - Mechanical Setting

The following tabulation shows the over-all distribution of all types of diamonds used and on hand during the year 1953:

TABLE VII

DIAMOND INVENTORY (Mechanical Setting), December 31, 1953

	<u>SCRAP CARBON</u>		<u>CONGO</u>		<u>LONGYEAR</u>		<u>"R" GRADE</u>		<u>"G" GRADE</u>		<u>TOTAL</u>	
	<u>Kts.</u>	<u>Amount</u>	<u>Kts.</u>	<u>Amount</u>	<u>Kts.</u>	<u>Amount</u>	<u>Kts.</u>	<u>Amount</u>	<u>Kts.</u>	<u>Amount</u>	<u>Kts.</u>	<u>Amount</u>
On Hand 1/1/53	296.52	\$4,376.77	327.16	\$1,943.24	459.12	\$5,050.32	29,496.66	\$237,221.40	6,802.52	\$64,849.65	37,381.98	\$313,441.38
Purchased 1953	1.11	32.70	19.50	136.62	-	-	12,578.34	110,386.22	585.75	6,416.55	13,184.70	116,972.09
<b>TOTAL</b>	<b>297.63</b>	<b>\$4,409.47</b>	<b>346.66</b>	<b>\$2,079.86</b>	<b>459.12</b>	<b>\$5,050.32</b>	<b>42,075.00</b>	<b>\$347,607.62</b>	<b>7,388.27</b>	<b>\$71,266.20</b>	<b>50,566.68</b>	<b>\$430,413.47</b>
Used 1953 (loss)	34.91	360.20	24.37	140.22	247.39	2,721.29	12,739.23	118,357.80	2,025.67	21,582.37	15,071.57	143,161.88
Scrap Credit	-	-	-	21.26	-	-	-	9,767.02	-	811.74	-	10,600.02
On Hand 12/31/53	262.72	\$4,049.27	322.29	\$1,918.38	211.73	\$2,329.03	29,335.77	\$219,482.80	5,362.60	\$48,872.09	35,495.11	\$276,651.57

DISTRIBUTION OF INVENTORY IN CARATS

	<u>SCRAP CARBON</u>	<u>CONGO</u>	<u>LONGYEAR</u>	<u>"R" NEW</u>	<u>"R" USED</u>	<u>TOTAL "R"</u>	<u>"G" NEW</u>	<u>"G" USED</u>	<u>TOTAL "G"</u>	<u>TOTAL INVENTORY</u>
Loose Bortz (Mfg's)	100.12	210.59		7,179.52	2,237.11	9,416.63	1,544.39	1,649.31	3,193.70	12,921.04
Loose Bortz (C.C.I.Co.)				200.00	102.85	302.85	200.00	123.65	323.65	626.50
Salvage Reports Pending	.55				1,304.29	1,304.29		11.90	11.90	1,316.74
Bits in Stock or Issued to Contracts	162.05	111.70	211.73		18,312.00	18,312.00		1,833.35	1,833.35	20,630.83
<b>TOTAL</b>	<b>262.72</b>	<b>322.29</b>	<b>211.73</b>			<b>29,335.77</b>		<b>5,362.60</b>	<b>35,495.11</b>	

4. Plant Account

Table VIII is merely an excerpt from the 1953 Financial Statement.

TABLE VIII

	<u>Account "A"</u>	<u>Account "B"</u>	<u>Account "C"</u>	<u>Total</u>
End 1952	\$19,775.26	\$150,861.88	\$180,089.59	\$350,726.73
End 1953	23,241.78	195,245.32	186,076.97	404,564.07

Group "A" - Life not exceeding 2 years  
 Group "B" - Life not exceeding 10 years  
 Group "C" - Rods & Casing - Depreciated on footage basis

Rental charges (per shift and per foot charges to cover depreciation and a portion of maintenance cost) amounted to \$30,558.45.

IV. SURFACE EXPLORATION

The projects discussed in this section of the Annual Report are those involving drilling in addition to geological and geophysical field work. The details of the geological and geophysical field work have been covered in Section II of this report.

A. Michigan

1. The following Table IX is a summary of the surface drilling including the cost analysis:

TABLE IX

SUMMARY OF SURFACE DRILLING - COST ANALYSIS

<u>LOCATION</u>	<u>HOLES</u>	<u>RIGS</u>	<u>OVER-BURDEN</u>	<u>DIAMOND DRILLING</u>	<u>TOTAL</u>	<u>1st CLASS ORE FOOTAGE</u>	<u>ORE %</u>	<u>TOTAL COST "A"</u>	<u>C/FT "A"</u>	<u>TOTAL COST "B"</u>	<u>COST/FT "B"</u>
Empire, Sec. 19, 47-26 (Deep)	1,2	C.C.I.	--	2,011	2,011	39	1.94	52,839.08	26.275	57,067.77	28.378
Empire, Sec. 19, 47-26 (Met.)	2,3,4	C.C.I.	86	527	613	0	0	10,759.30	17.552	11,401.99	18.600
Empire, Sec. 19, 47-26 (Total)	1,2,3,4	C.C.I.	86	2,538	2,624	39	1.49	55,359.82	21.097	59,112.00	22.527
Cascade, Sec. 29, 47-26	4A	C.C.I.	--	1,990	1,990	6	.30	43,868.50	22.044	47,619.42	23.929
Mather "B", Sec. 1, 47-27 (Surface)	148, 149	C.C.I.	130	292	422	0	0	4,949.63	11.729	4,992.36	11.830
Cliffs-Shaft, Sec. 3, 47-27 (Surface)	47, 48	E.J.L.	164	509	673	31	4.6	6,441.23	9.571	6,492.65	9.647
Sec. 4, 47-27 (Deep)	44, 44A	E.J.L.	--	2,956	2,956	354	11.98	80,376.82	27.191	84,001.50	28.417
Sec. 4, 47-27 (Deep)	45	C.C.I.	--	1,160	1,160	0	0	37,157.65	32.032	38,539.48	32.237
Sec. 4, 47-27 (Total Deep)	44,44A,45	E.J.L. & C.C.I.		4,116	4,116	354	8.6	117,534.47	28.555	122,540.98	29.772



TABLE IX CONT'D

LOCATION	HOLES	RIGS	OVER-BURDEN	DIAMOND DRILLING	TOTAL	1st CLASS ORE FOOTAGE	%	TOTAL COST "A"	C/FT "A"	TOTAL COST "B"	COST/FT "B"
Cliffs-Shaft, Sec. 4, 47-27	51	E.J.L.	44	207	251	0	0	2,234.63	8.903	2,267.83	9.035
North Lake, Sec. 5 & 6, 47-27	35,37,45,47 48,50,51,91	E.J.L.	210	4,672	4,882	38	.78	59,534.31	12.195	63,837.74	13.076
North Lake, Sec. 5 & 6, 47-27	41,46,49,90	C.C.I.	160	2,585	2,745	0	0	34,738.24	12.655	37,827.74	13.781
North Lake (Total)		E.J.L. & C.C.I.	370	7,257	7,627	38	.50	94,272.55	12.360	101,665.48	13.330
Cliffs-Shaft, Sec. 5, 47-27 (Surface)	36	E.J.L.	--	120	120	0	0	1,228.59	10.238	1,394.50	11.621
NE Sec. 5, 47-27 (Exploration)	38,39,40, 42,43,44	E.J.L.	352	910	1,262	149	11.8	16,845.31	13.348	16,998.86	13.470
Cliffs-Shaft, Sec. 10, 47-27 (Surface)	27,28	E.J.L.	114	280	394	6	1.52	4,620.71	11.728	4,743.16	12.038
Cliffs-Shaft, Sec. 10, 47-27 (Sur. New Shaft Site)	1-W,2-W, 3-W	E.J.L.	158	--	158	--	--	1,974.38	12.496	1,996.50	12.631
Total Cliffs-Shaft (Surface)		E.J.L.	480	1,116	1,596	37	2.32	16,499.54	10.338	16,894.64	10.586
Sec. 11, 47-27 (Deep)	20A,20B, 20C	C.C.I.	--	3,138	3,138	40	1.27	87,940.79	28.025	92,255.17	29.399
Sec. 11, 47-27 (Deep)	23,23A, 23B	E.J.L.	24	5,921	5,945	0	0	122,866.29	20.667	128,466.56	21.609
Sec. 11, 47-27 (Total)		E.J.L. & C.C.I.	24	9,059	9,083	40	.44	210,807.08	23.209	220,721.73	24.301
Humboldt, Sec. 11, 47-29	1,2,3	C.C.I.	0	515	515	0	0	3,256.86	6.324	3,756.86	7.295
Ohio, Sec. 22, 48-31	13,14, 15,16	C.C.I.	105	428	533	0	0	4,417.08	8.29	4,667.08	8.76
Ohio, Sec. 26, 48-31	47,48,49, 50,51	C.C.I.	59	359	418	0	0	2,951.44	7.061	3,216.01	7.694
Ohio, Sec. 22, 26, 48-31 (Total)		C.C.I.	164	787	951	0	0	7,368.52	7.748	7,883.09	8.289
Imperial, Sec. 25, 48-31 (Exploration)	14,15, 16,18	C.C.I.	47	293	340	0	0	4,115.19	12.11	4,715.48	13.87
Grossbusch, Sec. 13, 43-35 (Exploration)	10,11	E.J.L.	423	808	1,231	0	0	13,153.27	10.68	13,656.63	11.09
Grossbusch, Sec. 13, 43-35 (Exploration)	12	Odgers	216	969	1,185	0	0	6,183.53	5.22	6,302.22	5.32
Grossbusch, Sec. 13, 43-35 (Total)		E.J.L. & Odgers	639	1,777	2,416	0	0	19,336.80	18.00	19,958.85	8.26

TABLE IX CONT'D

LOCATION	HOLES	RIGS	OVER- BURDEN	DIAMOND DRILLING	TOTAL	1st CLASS ORE FOOTAGE	%	TOTAL COST "A"	C/FT "A"	TOTAL COST "B"	COST/FT "B"
Spies, Sec. 24, 43-35 (Surface)	83,84,85, 87,88	E.J.L.	1,492	3,806	5,298	0	0	55,743.17	10.52	58,585.33	11.06
Allen, Sec. 24, 43-35 (Exploration)	89	Odgers	168	57	225	0	0	2,559.00	11.37	2,664.87	11.84
McDermott, Sec. 25, 43-35 (Exploration)	86,1,1A	Odgers	766	2,105	2,871	0	0	22,416.47	7.81	22,943.70	7.99

Note: Cost "A" is the direct drilling cost. Cost "B" is the total of the direct and indirect charges including overhead.

## 2. Recapitulation by Organization

	NO. RIGS	FOOTAGE	% OF TOTAL
<u>DEEP HOLE</u>			
<u>DIRECT SHIPPING</u>			
Department	3	6,288	15.10
Contract	<u>2</u>	<u>8,901</u>	<u>21.36</u>
TOTAL	5	15,189	36.46
<u>SHALLOW HOLE</u>			
<u>DIRECT SHIPPING</u>			
Department	1	2,011	4.83
Contract	<u>6</u>	<u>13,994</u>	<u>33.59</u>
TOTAL	7	16,005	38.42
<u>METALLURGICAL DRILLING</u>			
Department	6	5,586	13.41
Contract	<u>1</u>	<u>4,882</u>	<u>11.72</u>
TOTAL	7	10,468	25.13
TOTAL DEPARTMENT SURFACE	10	13,885	33.33
TOTAL CONTRACT SURFACE	<u>9</u>	<u>27,777</u>	<u>66.67</u>
GRAND TOTAL ALL SURFACE	19	41,662	100.00



### 3. Summary of Results - Marquette Range

#### a. Cascade District - E. Richard Randolph, Geologist

##### 1'. Isabella Area, Section 29, 47-26

During the year 1953, core drilling was discontinued in the exploration program for deep high-grade ore near the footwall contact in the area bounded by the Isabella Dike to the south and the Palmer Fault to the north. No significant concentration of high-grade ore was encountered. Drilling presented unusual difficulties because of the excessive deviation of the drill holes. The mining lease for this property, Number 92A was surrendered to the Cascade Corporation.

##### 2'. Richmond Area, Section 27, 47-26

A program has been initiated to explore in the Cascade Basin, north and east of the new Richmond Mine, on lands owned by the Company. The drill holes will be tested in the upper portion for the metallurgical characteristics of the iron-formation and in depth for high-grade direct shipping ore. At the end of the year, drilling had not been begun, but a service road had been constructed.

##### 3'. Empire Area, Sections 19 and 20, 47-26

This area is being explored also for the metallurgical characteristics of the iron-formation down to a depth of approximately 500' for open pit operation and at greater depths for the possibility of high-grade direct shipping ore to be mined by underground methods. Hole Number 1 cut 39' of first-class soft ore at approximately 1200' from surface. Hole Number 2 was located 400' east of Hole Number 1 and did not encounter high-grade ore. Both holes were discontinued because of excessive deflection. Holes Number 3 and Number 4 were started by the end of the year, when the rate of exploration was accelerated with the addition of a second rig. The results of the metallurgical testing of the first 600' of depth in these holes has been encouraging. High grade magnetic concentrates with good weight recovery and iron unit recovery have been produced--the principal iron mineral being magnetite. This exploration is the most promising in Michigan for the year 1953 in terms of the metallurgical characteristics and the magnitude of the reserves.

#### b. Cliffs-Shaft Surface, Sections 3, 4, 5, and 10, 47-27, - J. P. Meyers, Geologist

This surface exploration is discussed in conjunction with the Cliffs-Shaft Mine, Section V, Subsection A-3-c.

#### c. Section 4, 47-27, Deep Soft Ore - E. Richard Randolph, Geologist

During 1953, the deep soft ore exploration program was continued in Section 4 employing two deep hole rigs. During the year, Holes Number 44 and Number 45 were completed and the exploration program discontinued. Hole Number 44 was drilled to a depth of 3491', when operating difficulties forced the drilling of a branch Hole Number 44A, starting at a depth of 3314' and continued to a depth of 3922'. This branch hole cored a total of 317' of first-class soft ore lying between the depths of 3400' and 3900'.

c. Section 4, 47-27, Deep Soft Ore (Cont'd) - E. Richard Randolph,  
Geologist

Hole Number 45 did not encounter ore, although it did cut oxidized iron-formation. It is planned to do additional exploration for deep soft ore from underground drifting sometime in the future from the Cliffs-Shaft Mine, "C" Shaft.

The sampling and drilling techniques employed in Hole Number 44A is worthy of note. Aquagel drill mud was employed with a special swivel tube core barrel. A good rate of advance was maintained with almost complete core recovery. The application of this technique marks a step forward in the exploration for the deep soft ores.

d. Section 11, 47-27, Deep Exploration - E. Richard Randolph, Geologist

In 1953, exploration continued for deep soft ore in Section 11 with two rigs in the northwest portion of Section 11, termed Area II.

One rig spent the year attempting to carry a branch hole at least 150' away from the parent Hole Number 20. This rig encountered considerable operating difficulties, but did succeed in Hole Number 20C to advance to a depth of 4401' by the end of the year, coring 38' of first-class soft ore in the so-called upper ore horizon. It did succeed also in the effort to achieve the separation, as it was approximately 265' away from the parent Hole Number 20 by the end of the year.

Hole Number 23, being drilled by the second rig, was located 500' northwest of Hole Number 20 in the effort to follow up the presumed trend of the ore discovered by the latter hole. The hole was drilled to a depth of 3827' being plagued by successive deviation. The hole was stopped as it would have intersected Hole Number 20 had it been continued. A branch Hole Number 23A was started at a depth of 3720' with the intent of deflecting to the south. This was abandoned at 3908'. Hole Number 23B was then wedged from a depth of 2025' in the parent Hole Number 23, and by the use of a special method, was brought back to the vertical. At the end of the year the branch hole had reached a depth of 3875' and was 400' away horizontally from Hole Number 20.

e. North Lake Project, Sections 4, 5, and 6, 47-27 - E. Richard Randolph,  
Geologist

This exploration project was completed in December. It consisted of drilling a series of northerly inclined holes on north-south cross-sections separated at 1,000' east-west intervals.

During 1953, twelve holes were completed employing two drill rigs. The drilling for 1953 totaled 7627' out of the grand total of 11,543' in seventeen drill holes for the two-year period.

The material cut was largely hematitic and goethitic cherty iron-formation with locally numerous small intrusives. The drilling confirms the anticipated magnitude of crude ore reserves. The metallurgical test results are not complete. The process being considered for concentration involves the use of Magnetic Oxide Conversion (M.O.C.). Further research at the Metallurgical Laboratory is planned on the samples obtained, but no further drilling is anticipated in the near future.

As drilling progressed in the east-central portion of Section 5, some first-class soft ore was discovered near ledge. Six holes were drilled totaling 1262' of which 149' was first-class ore. It had been hoped that this area might contain sufficient reserves of direct shipping ore to warrant an open pit operation. However, insufficient reserves were found.



f. Ohio Mine and Vicinity - Harold C. Boback, Geologist

1'. Ohio Mine

The East Pit of the Ohio Mine consists of the old Webster and old Portland Mine properties. During 1953, drilling was conducted at the western extremity of the East Pit with drill holes numbers 47-51 inclusive, Section 26, 48-31. The results have been encouraging and the ore reserves and pit operations are being extended principally to the west, and to a certain extent to the east, further than had been planned in 1952.

The West Pit consists of the old Ohio, Norwood, and Beaufort properties. Exploration was conducted on the Norwood portion with Holes Numbers 13-16 inclusive, Section 22, 48-31. The purpose of this drilling was to determine the nature of the crude ore material in areas lying between the original exploration cross-sections. The net results of this exploration were to confirm the previous estimates and show the continuity of treatable material. Of considerable interest is the drilling technique employed in the 1953 exploration campaign. Our trailer-mounted diamond core drill was used with the Longyear type "L" double tube swivel type core barrel. In excess of 90% core recovery was obtained with a better than average rate of advance.

2'. Imperial Mine - Land Offer 2874

During the year the Department reviewed available information and made a new estimate of the possible reserves. The Company obtained an option to purchase and in the Fall six exploration holes were drilled on this property, four by diamond drilling and two by churn drilling. In general, the results of this exploration indicate that the treatable reserves are confined within the limits of the old workings. The principal reserves are contained in two shaft pillars below the bottom workings.

A modest amount of electromagnetic induction prospecting was conducted on the western portion of the property. Three north-south traverse lines, each about 1200' in length, were run with this method. The geophysical work appears to have detected the contacts of the iron-formation with the underlying and overlying rocks.

3'. Titan Mine - Mine Lease 111

The exploration work in 1953 consisted of carrying the mine survey into the area and running nine cross-sections by the electromagnetic induction method. The results of this geophysical work indicate the portion of the iron-formation which is oxidized. These results coincide quite well with the old Ford Motor Company diamond drilling.

g. Humboldt Mine - Robert H. Mount, Geologist

During the year, plane table mapping together with outcrop and dump sampling was conducted. Since grade control of the crude ore feed to the mill continually presents a problem, an experimental campaign was inaugurated using a small wagon-mounted diamond core drill. Three holes were drilled near the footwall contact; the results of this drilling confirmed our belief that a modest program of this type is important in the mine operation.

g. Humboldt Mine (Cont'd) - Robert H. Mount, Geologist

As the hydraulic stripping of the mine progressed, the mapping and sampling referred to above was continued. The additional exposures showed the complexities of ore grade and contacts as had been suspected. In addition the general dip of the bedding can be said to be approximately 45° to the west.

h. Republic Mine - Harold C. Boback, Geologist

During the year there was no exploration activity of any kind on the Republic property.

Activity of a geologic nature consisted of mapping the outcrops on the property along sectional profile traverses run by the Engineering Department, and reviewing old geologic maps and information of the property.

New fifty foot east-west cross-sections were made of the pit area through exploration holes previously drilled.

4. Summary of Results - Menominee Range

a. Section 13, 43-35 - David M. Bennett, Geologist

In 1953 exploration continued in Section 13 on the McGillis, Grossbusch and Boyington properties. This year's activity centered on the Grossbusch portion, namely, the northeast quarter of Section 13.

Three holes were drilled, numbers 10, 11, and 12. The latter hole had its collar location on the Boyington property and was directed to reach a desired target on the Grossbusch property.

Each of the three holes encountered unoxidized iron-formation, confirming our belief that the iron-formation is progressively faulted as it dips to the north.

Since no oxidation or ore concentration was found, the exploration was discontinued and the mining leases surrendered.

b. Spies Mine Surface, Section 24, 43-35 - David M. Bennett, Geologist

During the year 1953, one contract drill was engaged in surface exploration of the Spies Mine East attempting to follow the ore structures from the mine workings to old Hole Number 79 to the south. Holes 83, 84, 85, 87, and 88 were drilled. These holes encountered both oxidized and unoxidized iron-formation, together with a large amount of hangingwall material. This suggests a revision of the possible structure by which ore may continue from 79.

c. Allen Exploration NW $\frac{1}{4}$  of SW $\frac{1}{4}$ , Section 24, 43-35, David M. Bennett, Geologist

This parcel was Land Offer 2863 and has now become mining lease 110. Drilling was commenced in December on the first hole Number 89. The hole cut 168' of overburden and ledged in a gray slate with chert seams, reaching a total depth of 203'.

The exploration is aimed at an east-west trending limb of iron-formation, extending from the Carlson Exploration to the east and the Turoski Exploration to the west.



d. McDermott (Wheat) Exploration, Section 25, 43-35 - D. M. Bennett,  
Geologist

The McDermott consists of the west half of the east half of Section 25, Land Offer 2747, Mining Lease 109. Exploration drilling started in July. The first hole had its collar to the north of the McDermott property on the Spies Mine land, and hence was known as Hole Number 86, Section 24. It cut 375' of overburden and was stopped at a depth of 1287' after cutting unoxidized iron-formation.

The second Hole Number 1, Section 25, was located 400' due south of Hole Number 86, Section 24. This hole cut 406' of overburden and continued in hangingwall material to a depth of 1221' below which 121' of lean ore and oxidized iron-formation was cut. This latter portion was redrilled by a branch Hole Number 1A. The latter had reached a depth of 1306' by the end of the year in hematitic and goethitic argillaceous iron-formation.

B. Minnesota

The usual mine exploration of structure and/or diamond drilling conducted at the mining properties is not discussed in this report. This information can be found in the report of Mr. Hugh Leach, Manager for Minnesota.

The only other drilling done was that on the Cushing Exploration west of Coleraine, on the Mesaba Range; and on the Vermilion Range, Section 22, 61-14, Land Offer 2914. This latter project has already been discussed under Section II, Subsection B-1-c.

C. Canada

The principal exploration project in Canada for 1953 conducted by the Canadian Cliffs, Ltd. was the Temiscamie, Albanel Area of the Misstassini Region, Province of Quebec. This was known as Outside Exploration 1031. Later, the project was subdivided into three land offers:

Land Offer 3119 - Temiscamie, 44 claims  
Land Offer 3020 - Albanel, 115 claims  
Land Offer 3021 - Sand Spit, 67 claims

In general, the most extensive field work was done on the Temiscamie group. Also, this group was the only area explored by diamond drilling. Nine holes were drilled; seven being along profiles on Beauchemin Mountain and the other two being on the so-called "Gauthier's find." The total footage amounted to 2945 feet.

The material sampled on surface and cut in the drill holes was magnetic cherty iron-formation.

Figures 7 and 8 are photographs of this exploration.



Figure 7



View of the Temiscamie River from Beauchemin Ridge.  
Dr. M. W. Bartley, Resident Manager, and Dr.  
J. M. Neilson, Exploration Chief, left to right.

Figure 8



View of Beauchemin Ridge from the Temiscamie River.



D. Venezuela

Land Offer 2644 El Trueno

A very extensive exploration program was conducted on the El Trueno property during 1953. This included surveying, drilling, tunneling, geologic field mapping, and final preparation of maps, sections, and a tonnage estimate.

A total of 117 holes was drilled. One hundred and five holes were drilled in the main hill, 9 holes in Claim 11, and 3 holes in Claim 12. Claims 11 and 12 are about four miles to the north of the main hill. In addition to the drilling, four exploration tunnels were driven into the main hill.

A total of 5,204 meters (17,069 feet) of hole was drilled at the exploration. The combined depth of the tunnels was 231.10 meters (758.2 feet). The area explored by drilling and geologic mapping on the main hill is 5,000 meters (16,400 feet) long and varies in width up to 1,000 meters (3,280 feet).

Drilling was carried out mainly by three Failing drills using both coring and non-coring bits, with a bentonite base drilling mud for fluid. A small part of the drilling was done by conventional diamond drill rigs.

The ore reserves at El Trueno fall into two types of deposits--the hard rubbly and cellular canga ores which occur in blanket-like deposits on the surface, and the soft blue granular ores which at El Trueno occur in a synclinal trough.

A total of 88,668,000 tons of first-class ore was estimated of which approximately 30,000,000 tons lie in the canga deposits and the remainder in the soft ore deposits. Of the total reserve, 83,442,000 tons were estimated on the main hill and 5,226,000 on Claims 11 and 12.

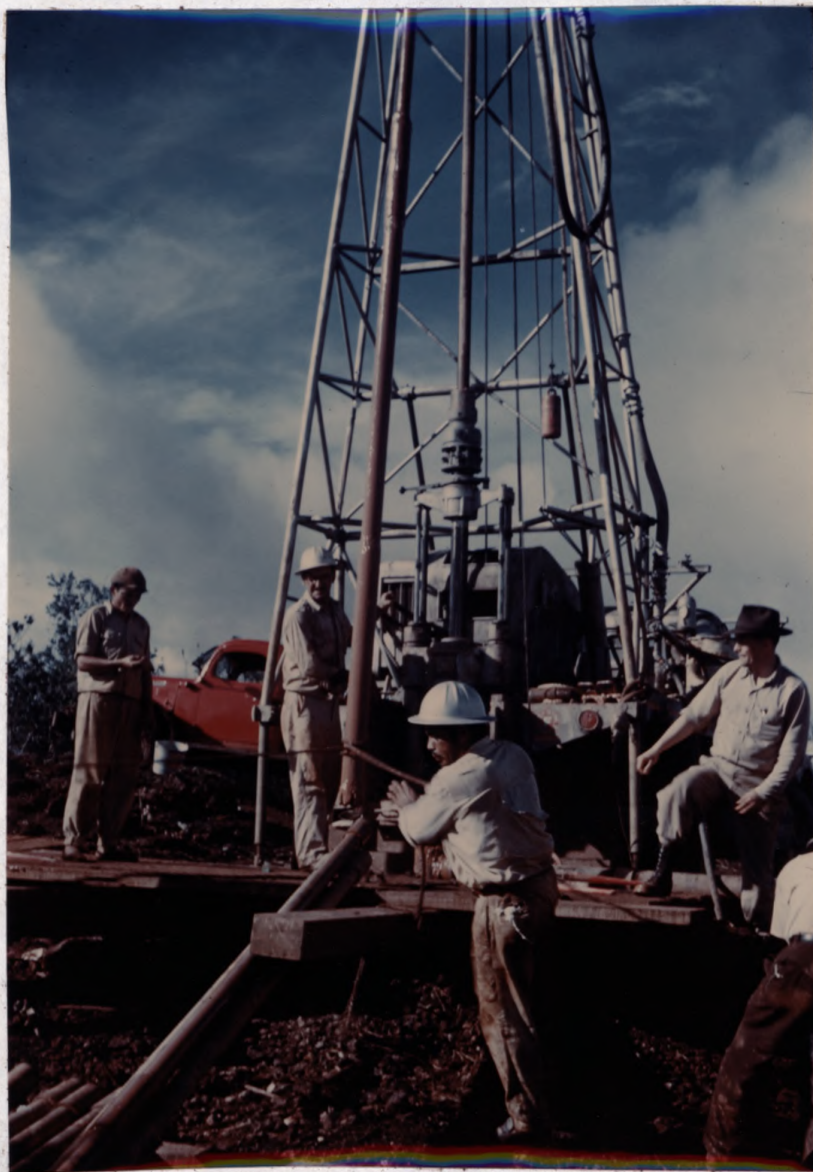
The expected average dried analysis of the ore reserves on the main hill is as follows: Iron 63.73, Phos. .062, Silica 4.28, Man. .113,  $TiO_2$  .277, Alum. 1.79, Lime .083, Mag. .033, Sul. .024, Loss of Ign. 1.755, and Moisture 3.15.

At the end of December, the exploration option was surrendered and the Guayana Company dissolved.

Figure 9 is a photograph of a typical drill rig setup.



Figure 9



El Trueno, Venezuela  
View of a typical setup showing drill rig.



V. UNDERGROUND EXPLORATIONA. Michigan1. Summary of Drilling

The following tabulation Table XI is the summary of underground drilling:

<u>TABLE XI</u>									
<u>LOCATION</u>	<u>HOLES</u>	<u>RIGS</u>	<u>DIAMOND DRILLING</u>	<u>1st CLASS ORE FOOTAGE</u>	<u>%</u>	<u>TOTAL COST "A"</u>	<u>C/FT. "A"</u>	<u>TOTAL COST "B"</u>	<u>C/FT "B"</u>
Athens	50-53	C.C.I.	912	350	38.37	\$ 6,982.44	7.66	\$ 7,109.20	7.80
Bunker Hill	11, 19-33	C.C.I.	5,655	1,579	27.92	58,875.78	10.41	59,693.93	10.56
Cambria-Jackson	209-217	C.C.I.	3,107	180	5.8	18,105.34	5.83	19,046.22	6.13
Cliffs-Shaft	832-898	C.C.I. (Mine)	6,047	1,085	17.94	31,589.16	5.224	36,314.81	6.005
Maas (Including Pioneer & Arctic)	75-77	C.C.I.	756	307	40.6	3,181.38	4.208	4,127.50	5.46
Mather "A"	145, 149, 152, 154, 155, 156 161, 163, 167, 171-173, 179- 185, 191-195, 205-207, 210- 212, 215-217, 219, 222, 223, 228.	C.C.I. (Mine)	10,557	2,119	20.07	85,461.96	8.09	91,889.89	8.70
Mather "B"	153, 160, 162, 164-171, 174-178, 182, 186-190, 196-204, 208, 209, 213-215, 218, 220, 221, 225-227.	C.C.I. (Mine)	12,113	3,492	28.8	76,761.01	6.33	85,172.96	7.03
Spies Mine	63-77	Odgers	6,924	344	5.0	62,840.24	9.07	68,988.71	9.96

2. Recap by Organization

The following tabulation Table XII is the recap of organization:

<u>TABLE XII</u>			
<u>ORGANIZATION</u>	<u>NO. OF RIGS</u>	<u>FOOTAGE</u>	<u>PER CENT</u>
a. C.C.I. Co.			
1. Department	5	10,430	22.36
2. Mine	11	28,717	61.54
b. Contract	<u>3</u>	<u>7,510</u>	<u>16.10</u>
Total	19	46,657	100.00

### 3. Summary by Properties - Marquette Range

#### a. Athens-Bunker Hill Mine - Joseph L. Patrick - Geologist

1'. Athens Mine - The exploration by drilling, for 1953 was centered in three areas: above and south of the old 1030 drift in the south ore body; in the north ore body along the 1600 W. above and below the 10th level, and in the area immediately east of the 1500 crosscut from the -990' Sub-Level, one hole was drilled to explore for height.

The purpose of the drilling exploration was to further delineate the shape of the known ore bodies for mining control. Four holes were drilled and these holes proved up a greater tonnage of ore than had been anticipated.

Routine mapping of the working places did not disclose any major changes in the Athens structure.

2' Bunker Hill Mine - The accelerated exploration program which had been initiated during 1952 was continued through the first seven months of 1953. After this period only one machine was used. The major exploration activity was conducted on four north-south sections: 2100 W., 2200 W., 2400 W., and 2800 W. In all, sixteen holes were drilled of which twelve explored the complex area between the east boundary and the 2400 W. The other four holes explored to the west of the 2400. The exploration added to the existing knowledge of the structure and also increased the proven reserves of the Bunker Hill Mine.

3' Negaunee Shaft - The Negaunee Shaft was completed below the 14th level in a coarse crystalline dike. Drifting southward from the 12th and 14th level plats cut dark slate and graywacke. The drifting on 12th level had cut the main Athens dike but had not reached the ore body at the year's end.

#### b. Cambria-Jackson Mine - Layton C. Binon, Geologist

The exploration and development programs conducted during the year were unsuccessful in maintaining ore reserves at the 1952 estimate.

The extreme east end of the Jackson Strip was explored from the 6th level by diamond drilling. Eight holes were drilled to explore for the 6th, 7th and 8th levels. Two of these holes were started on Teal Lake Iron Company property. This work indicated only a very small tonnage, all of which was in the Jackson Strip. This ore will be developed for mining from the 6th level.

Two cross-cuts were driven east of the main workings on the 7th level to develop ore found by diamond drilling in 1952. One diamond drill hole was drilled to explore for 8th level from this development and indicated that ore is available to the 8th level in this area.



c. Cliffs-Shaft Surface - R.M. Becker & J. P. Meyers - Geologists

Sections 3, 4, 5 and 10, 47-27 - The surface hard ore drilling in these sections is discussed in the Cliffs-Shaft Mine summary under Part V, Sub-division A-1.

Cliffs-Shaft Mine - Underground drilling during the year was guided by the 1952 "New Shaft" ore estimate and the 1953 revision of this estimate. Some drilling was done to facilitate development in conjunction with the new shaft project. Underground drilling was done in all areas of the mine except the "B" Shaft Far West workings. The largest amount was done in the "A" Shaft and "B" Shaft areas.

Drilling in the "A" Shaft, "A" Shaft South, "A" Shaft East, "A" Shaft North, and "B" Shaft areas may be considered nearly complete. The old Moro Mine workings and "B" Shaft Far West workings remain to be drilled. Significant tonnage additions were proven in the "A" Shaft area and in the "A" Shaft North area (Bancroft Lease).

Drilling in Sections 4 and 5 was discontinued when the structure encountered was not as had been anticipated. The drilling in Section 4 encountered the main "hard ore" north limiting fault and served to further substantiate the presence of this major fault.

One hole, D.D.H. 47, drilled in Section 3, 47-27, was discontinued when the structure encountered was not as had been anticipated. The other hole, D.D.H. 48, drilled in Section 3 encountered the anticipated structure and cored 32' of first class hard ore. This hole, along with U. H. 792, proved up a significant tonnage addition in the "B" Shaft area and served to aid the planning of development necessary to mine this body.

Three water wells were drilled at the new shaft site in Section 10 to establish the elevation of the water table and ledge before sinking commenced.

Two holes in Section 10, 47-27, failed to prove any enrichment east of the Moro Mine workings and served to discourage further exploration for hard ore in this area.

Future surface exploration for extensions of hard ore, which might be above present mine elevations, will be confined to the area of the "B" Shaft Far West workings and perhaps one hole in Section 5, 47-27.

Referring to Table XII it is noted that the cost per foot for drilling in the mine increased from \$3.968/ft. in 1952 to \$6.005/ft. in 1953. This increase is due to two factors; 1. a wage increase during 1953 and, 2. more extensive moving during 1953. In the future as the mine diamond drill exploration program approaches completion, moving is going to become even more extensive since locations will be farther apart and a proportionate increase in costs will be sustained.

d. Lloyd Mine - David M. Bennett - Geologist

No geological activity was carried on for the year other than routine mapping and studies.

e. Maas Mine - Layton C. Binon - Geologist

Late in the year diamond drilling was started on the 7th level to explore for a western extension of the main ore body in the Maas-Mulvey and Pioneer & Arctic areas. The drill station is 400' west of last section where the outlines of the ore body are defined. Information from the drilling at the end of the year indicates that the ore body continues westward with the same tonnage and grade as was previously known but with a much flatter pitch.

The average sulfur content of the ore drilled was 0.208%. No information was gained which would indicate the location of a major deposit of low sulfur ore.

Of 756' of diamond drilling which was done during the year, 165' was drilled on Pioneer & Arctic property.

f. Mather Mine

1'. "A" Shaft - Donald L. Gilbert - Geologist.

A continuous underground diamond drill exploration program consisting of 37 drill holes from 3rd, 5th and 7th levels was carried out during the year.

Following an extensive drill campaign from the -340' Sub-level and the completion of the 3rd. Level, #6 Crosscut, five holes were drilled from the Crosscut to outline reserves available for mining from 3rd. Level. The drilling established the eastern and western limits and the structural trend of the hangingwall ore pipe from 3rd. Level to 2nd. Level elevation.

Five holes were drilled by Mather Mine "A" Shaft in Section 1, 47-27, following the completion of crosscut stubs as the 5th Main Level was driven east towards Mather Mine "B" Shaft. This drilling provided more detailed information on planning for future operations on an ore body to be mined from 5th Level.

The major portion of diamond drilling was between the 6th and 7th Levels and from 7th Level Crosscuts for the purpose of exploring for the outlining ore bodies for 7th Level mining, for establishing footwall location and ore reserves for 8th Level development and mining, and for structural information.

Drilling from the 7th Level east of the 7700 Crosscut and west of the Section 1 and 2 boundary uncovered a new ore body to be available for 8th level mining.



Exploration from the #1 Crosscut and from a drill station 200' west outlined and further established the westward continuation and build up of ore above 7th level adjacent to east-west trending intrusives.

Drilling from the #5 and #6 Crosscuts began a program to outline the footwall location and ore reserves for 8th Level development and mining. To date the anticipated normal footwall dip and ore reserves east of the Mather Fault below 7th Level have been confirmed.

Structural drilling continued from 7th Level to prove the flattening of the footwall west of the Mather Fault. One hole drilled south from the 7100 Crosscut proved the footwall to be flat to approximately the 3,000 S. coordinate where a fault zone and major intrusive or sill was encountered. Further drilling is planned to determine the eastern extent of this structure, which will have effect on reserves available for lower levels.

Microseismic studies were continued in DDH 65 during the year. Observations did not indicate any substantial rock movement. During the year the air flow reversed in the hole and is believed to have been due to a change in air direction underground when the 7th Levels were connected.

In order to obtain further information on cave progression and as a correlation between recordings in DDH 65 plans were drawn up during the year to drill a long hole from the 1st Level to house a geophone over a large stope area.

#### 2'. "B" Shaft - Charles R. Pace - Geologist

An extensive diamond drill program was carried out at Mather Mine "B" Shaft during 1953. The major portion of the drilling was done from 7th Level with the remainder being distributed among 4th, 5th, 6th and 8th Levels. The program was planned to cover four major objectives. These were as follows:

1. 4th Level geophone installation.
2. Outlining 5th Level ore.
3. Outlining and detailing 7th Level ore.
4. Outlining and detailing 8th Level ore.

In general, a steady increase of tonnage in the ore reserves was noted during the year as exploration and development progressed on 5th, 7th and 8th Levels. The 5th and 8th Level reserves were each increased by a half million tons. Approximately two million additional tons were proven for 7th Level during the year. Exploration has been completed on 6th Level and only small amounts of detail drilling remains for 5th and 7th Levels. Ore structures proven on 8th Level during the year indicate that large tonnages should be proven on this level in 1954.

4th Level - One hole was drilled from 4th Level for subsidence studies. The hole was drilled to a depth of 1,400' and located so that it would be above the immediate mining areas. A geophone was installed in the hole during the year.

5th Level - A total of five holes were drilled by Mather Mine "A" Shaft to explore the "B" Shaft side of 5th Level. The 5th Level tonnages were increased considerably by this drilling.

6th Level - Four holes were drilled from 6th Level during the year. Of this drilling, one hole was drilled for 5th Level contacts, one for 6th Level contacts and two for 7th Level contacts. No significant change was noted as a result of this drilling.

7th Level - A total of twenty-six holes were drilled from 7th Level. The drilling was concentrated on detailing ore outlines prior to mining. Of the 7th Level drilling, four holes were drilled for 8th Level contacts. The 7th Level drilling increased the standard ore available to this level by two million tons.

8th Level - On 8th Level, the diamond drill activity increased considerably towards the end of the year. A total of twelve holes were drilled. The drilling was confined to the mainline and Crosscuts and both proceeded and followed development. A considerable increase in tonnage for 8th Level was realized during the year as a result of this drilling.

Pumping - During the latter two months of 1953, a program was started which will eventually lead to the draining of the underground workings of the Sand and North Shafts in the North Jackson Pits. These workings overlie a portion of the Mather Mine "B" Shaft workings. Although the water is some 2,000' above the "B" Shaft workings, it still represents a future danger zone since any cave intersecting this area would result in the unrestricted flow of a large volume of water. Looking to the future, a program was initiated which encompassed the location of the old stope by diamond drilling and the subsequent churn drilling and pump installation. By the end of the year, surface diamond drill holes 148 and 149 had been put down and the old stope located approximately 150' below surface. Plans for 1954 include test pumping to determine the drainage and permeability of the workings. This information will help in determining the churn drill hole size and pump requirements.



4. Spies Mine - David M. Bennett - Geologist

Exploration in the mine dealt with two areas in 1953--1. above 8th Level--2. below 8th Level.

UH 63 tested the main Spies East Deposit at 300' below 8th Level and UH 73 tested the ore body at 650' below 8th Level. This drilling indicated that the ore body retained nearly the same width at depth as on 8th Level. A slight flattening to the west is evident. UH 65 drilled  $-45^\circ$  to the west of the Spies East Deposit and intercepted some oxidized iron-formation and ore mixed. This hole along with the other westward drilling above 8th Level indicated a tightly folded repeating hangingwall to footwall sequence to the west of the Spies East Deposit.

UH 68 and 70 drilled from the 8th Level cut-out midway between the shaft and the Spies East Deposit. These were aimed at possible enrichment in the tight folds which proceed west from the Spies East Deposit. Only unoxidized iron-formation was cut in these holes.

UH 67 and 72 pushed out to the south and west of the south tip of the present Spies East Deposit in order to detect the strike of the iron-formation. These holes indicated the formation is trending to the west.

UH 64, 66, 69, 71 and 74 tested the fault and fold area west of the Spies East Deposit and have proved a possible ore body which enlarges from 8th up to 6th Level and widens to the south. This program will continue drilling to the south and west for ore available above 8th Level.

## VI. Land Offers and Outside Explorations

### A. Land Offers

During the year 1953, the Geological Department continued to process the various land offers submitted to the Company. The mineral land offers may be subdivided into six general groups, as follows:

<u>Area</u>	<u>No.</u>	<u>Percent of Total</u>
1. Michigan	32	25.0
2. Minnesota	15	11.7
3. U. S. General	6	4.7
4. Canada	69	53.9
5. South and Central America	5	3.9
6. Africa	1	.8
Total	<u>128</u>	<u>100.0</u>

The trend started in 1952, that of a greater proportion of land offers being in Canada, continued into 1953. During the first 10 months of 1953, a total of \$ 7,189.67 was spent on Michigan, Minnesota and United States General land offers. Expenditures for South and Central American land offers are not available at this time. Figure 10 is a 5-year mineral analysis of the land offers.

### B. Outside Explorations

During 1953, there was a decrease from 1952 of about 25% in the number of Outside Explorations considered by the Department. Figure 11 shows the distribution of Outside Explorations into the same six groups as used for the land offers.

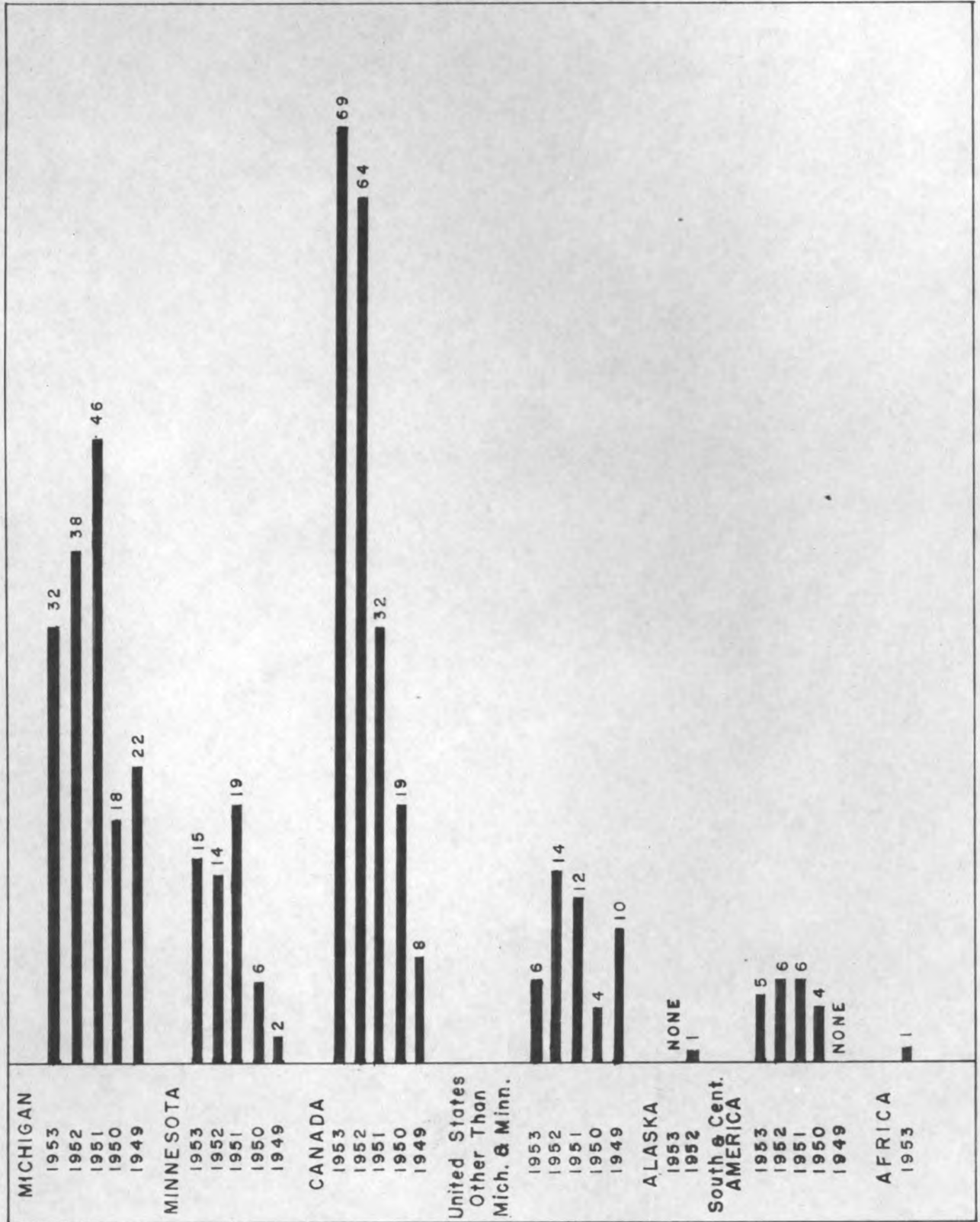
<u>Area</u>	<u>No.</u>	<u>Percent of Total</u>
1. Michigan	4	12.9
2. Minnesota	3	9.7
3. U. S. General	2	6.5
4. Canada	22	70.9
5. South and Central America	0	0.
6. Africa	0	0.
Total	<u>31</u>	<u>100.0</u>



Figure 10

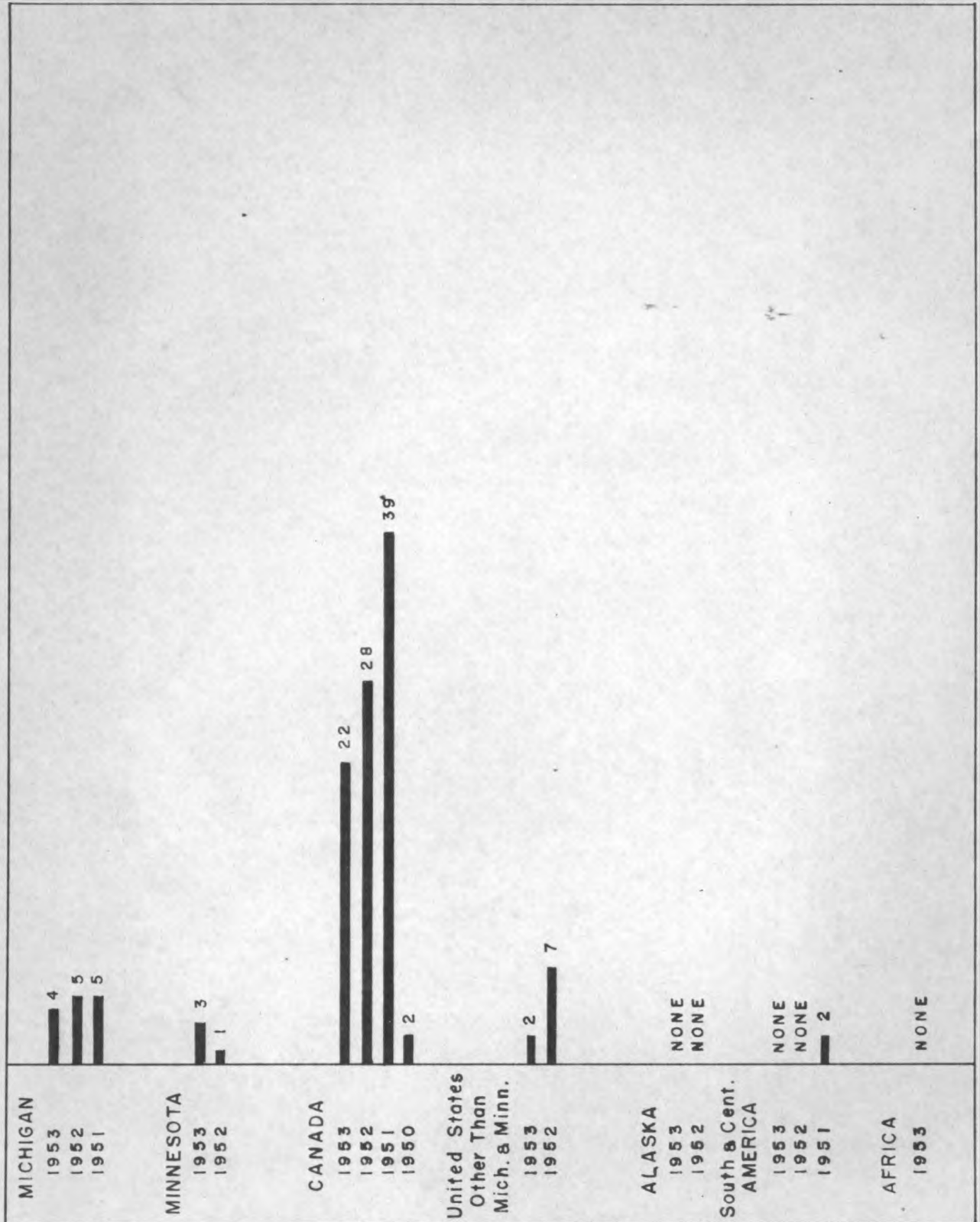
GRAPH SHOWING RATE OF  
MINERAL LAND OFFERS

1949-1953, inclusive



GRAPH SHOWING RATE OF  
OUTSIDE EXPLORATIONS

1949 - 1953, inclusive





## VII. OTHER DEPARTMENTAL HIGHLIGHTS

### A. Exploration Drilling

#### 1. Mud Drilling

For years, water has been the standard drilling fluid in exploration drilling in metal mining. The petroleum industry, on the other hand, has employed "drill muds" as the drilling fluid. Bentonite or clay is the most common base, with starch, zeolites, salt and other materials also used for special purposes. The major advantages of muds lie in their wall stabilizing characteristics and in their ability to transport the drill cuttings.

In 1947, on the Marquette Range, the Geological Department pioneered the practical application of drill mud in penetrating the surface overburden. Again in 1948, the Department was the first to employ drill mud in iron formation while rotary drilling at the Holman-Cliffs Mine. In 1953 two other interesting applications were made:

##### a. Section 4, 47-27, Deep Drilling

Drill mud was used successfully in deep hole 44 while sampling the ore section from 3400 to 3900 feet. It is doubtful whether the hole could have been advanced, even with casing, if mud had not been used. In addition to stabilizing the walls and bringing the greater part of the cuttings to surface, the use of mud appeared to promote better core recovery.

b. The other interesting application was at our El Trueno exploration in Venezuela. The use of drill mud in this exploration added measurably to the success and to the speed of this drilling. Several variations on the sampling of the cuttings were tried, including the use of vibrating screens.

#### 2. Portability

During 1953, we continued our efforts to make our drill rigs as portable as possible with the goal of cutting down the setup and rigging down time which is nonproductive. Two items of interest are as follows:

##### a. Trailer Drill

Our trailer drill which had been purchased in 1950 was modified and used on the Ohio Mine exploration. The unit was found to be very flexible in setups in a variety of terrain, the nonproductive time was held to a minimum. From a sampling viewpoint, the rig was quite successful and recovered over 90% core in this program.

##### b. Wagon Drill

With the advent of operation at the Humboldt Mine in early 1954, the Department renewed its efforts to work out an inexpensive method for grade control of the mill feed at the Humboldt Mine. The original exploration drilling was done on 500 to 600 foot centers with considerable variation in the mineralogy of the crude ore between this known information. The thought was to work out a portable wagon-mounted diamond core drill capable of up to 300 feet of 1½" hole (EX size) recovering a 7/8" core. Further, the plan was to send all of the core to the Metallurgical Laboratory for testing. Three holes were drilled involving the close collaboration of the Department with the Industrial Engineering staff, using time studies. We believe that the experiment was a definite success and the results indicate that this type of drilling is worthwhile during the warm weather months.

Figures 12 and 13 illustrate this setup.



Humboldt Mine  
Views of wagon-mounted diamond core  
drill engaged in grade control drilling.



### 3. Diamond Bit Research

For several years, we have followed the basic research work on diamond core bits being done by the U. S. Bureau of Mines and the School of Mines at the University of Minnesota. This research centered on the selected orientation of the individual bortz diamonds so that the hard vector is oriented for maximum penetration and minimum wear. During 1953, a number of bit manufacturers placed oriented diamond bits on the market. A number of us attended the 5th Annual Diamond Drill Symposium at the University of Minnesota in October and were impressed by the results to date. In November we organized a research project using two sizes of oriented diamond bits in our most difficult drilling ground and also employed drill rigs which were instrumented to show the basic performance factors. We were assisted by Mr. Albert E. Long, diamond drill engineer for the U. S. Bureau of Mines, Mount Weather Station, Bluemont, Virginia. Results are not finally tabulated as yet, but are interesting and will be reported on in the future.

### B. Geophysical - Electromagnetic Induction Experimentation

Since 1946, the Geological Department has been employing geophysical methods in the Company's exploration program for iron ore. The principal method employed has been that of magnetic prospecting using both the magnetometer and the superdip. In general, the magnetic methods have been supplemented to a varying degree by the other techniques, such as gravity, electrical, and seismic prospecting. It has been our policy to keep abreast of any new geophysical techniques that might have application to iron ore exploration. During the summer of 1952, a geophysical party, under the direction of Doctor G. P. Woollard of the University of Wisconsin, conducted basic research in northern Wisconsin, in part, on the Penokee-Gogebic Range and on the Keweenaw sediments and flows to the north. This party experimented with the electromagnetic technique with encouraging results. Our review of current methods during the Spring of 1953, led us to consider this technique. We found that the only company having available equipment coupled with technical knowledge and experience, was the McPhar Engineering Company of Toronto, Ontario. After much negotiation, we were able to secure a one-week experimental period on the Marquette Range at the end of August and beginning of September. These initial results on known areas underlain by variety of iron formation and ore types warranted further experimental study. A basic understanding was reached with the McPhar Company whereby a joint program of research was undertaken leading to the possible purchase of two or more of the complete electromagnetic induction units.

In October and November we continued the experimental technique on both the Michigan and Minnesota Ranges. The results were encouraging and have led us to recommend the purchase of two of these units. Figures 14 and 15 show the equipment.

The McPhar Company is the largest geophysical company in Canada engaged in non-petroleum work. They have made extensive application of the technique in the past six years in base metal exploration. It is interesting to note that our joint effort with them marked the first application of this technique to iron ore exploration. The application of this technique in 1954, within its limitations, may prove to have been a most valuable adjunct to our iron ore exploration.

Figure 14



Electromagnetic Induction  
View showing antenna and portable transmitter.  
Mr. Robinson of the McPhar Company in photograph.



Figure 15



View showing the receiver assembly in operation.  
Mr. Cartier of the McPhar Company in photograph.

### C. Microscopy

In 1953, the Metallurgical and Geological Departments collaborated in establishing a Microscopy Section and engaged Mr. Tsu-Ming Han on April 15th. Mr. Han is a graduate student in geology from the University of Minnesota specializing in microscopic work. Our goal in this work is to determine the basic facts of the mineralogy and the relationship of our ore and gangue material in our continuing studies. Mr. Han centered his activities on our major current projects, namely, Republic, North Lake, and Empire. He had worked on the crude ore from the Humboldt Mine during 1952 as a summer employee.

In each of Mr. Han's studies, we have attempted to relate the microscopic findings to the test results of this same material as processed through the Metallurgical Laboratory. Mr. Han's work shows a close correlation with these test results. He has also contributed to our knowledge of the change of mineralogy as related to the major structural features and to the metamorphic features.

Figure 16 (photomicrograph no. 177b) is from the Republic Mine, Drill Hole Number 8, and shows the replacement of the chert bands by specular hematite. Figure 17 shows an intergrowth of magnetite and specular hematite, also from Hole Number 8 at the Republic Mine. Figure 18 (photomicrograph no. 256) shows the alternating layers of goethite and cherty goethite martite from the North Lake project. Figure 19 (photomicrograph no. 237) is from the Empire project and shows the magnetite in the carbonate-silicate ore.

### D. Mine Subsidence and Ground Water

The Geological Department continued its collaboration with the Mining Engineering Department on studies relating to our mine subsidence and mine ground water. During the year, we met with representatives of the U. S. Bureau of Mine, Applied Physics Division, and the Ground Water Section of the U. S. Geological Survey. Of particular interest, was our over-all subsidence study on the Marquette Range prepared by the Department for Mr. Carl Brewer in the general study of community planning and railroad relocation.

### E. Special Reserve Study

In the fall of the year, the so-called 1970 Special Reserve Study was brought up to date. In addition, a special graphical study was made supplementing the tables previously used. One part of the graphical study was entitled, "The Production Depletion Graph" which shows pictorially the life history of our properties over the next sixteen years. Individual graphical studies were made for each mine to show their relative values in terms of reserves, iron content, production, and so forth, to be used as a guide in our exploration work.

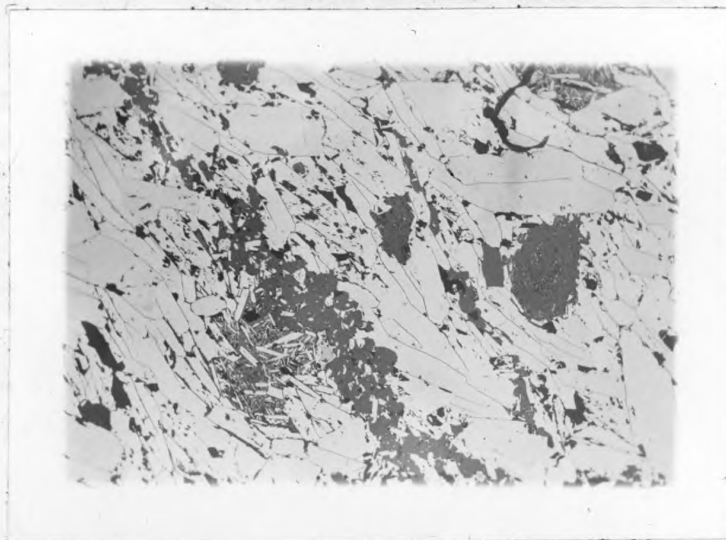
### F. Air Sampling

During the second half of 1953, the Department collaborated with the Safety Department in continuing study on the possible occurrence of radioactive gases and particles in our mine air. This involved the development of specialized techniques together with the acquisition of detecting and sampling devices. The principal activities centered at the Maas Mine and later sampling was completed in a reconnaissance sense at the Spies and Cliffs-Shaft Mines. The results to date indicate that with adequate ventilation, there is no problem existing in this regard.



Figure 16

Republic



The metasomatic replacement of chert bands by specular hematite in a high grade cherty specular hematite ore. Specular hematite, greyish white; chert, grey; and pits, black.

Magnification: 28

Common ore size: 150 Mesh

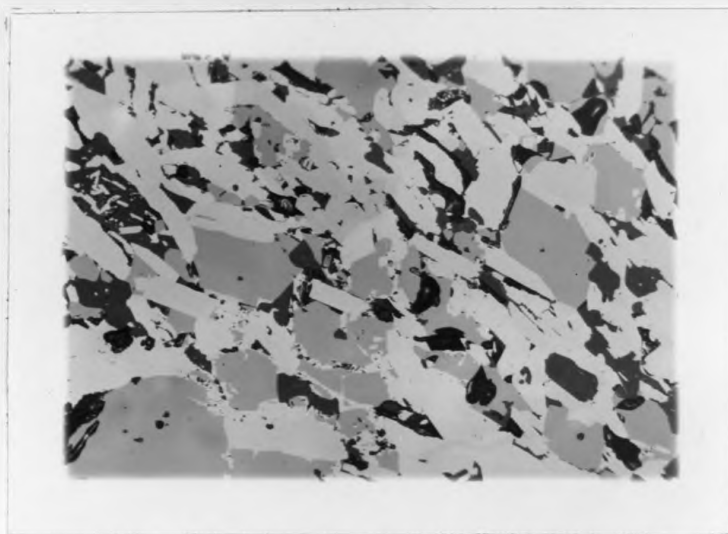
Hole No. 8. Depth: 198'

Polished section No. 304

Photomicrograph No. 177b

Figure 17

Republic



Intergrowth of magnetite and specular hematite. The former is generally replaced by the latter. Magnetite, grey; specular hematite, white; gangue, dark grey; and pit, black.

Magnification: 125

Common ore size: 100 mesh(magnetite) 325 mesh (specular hematite).

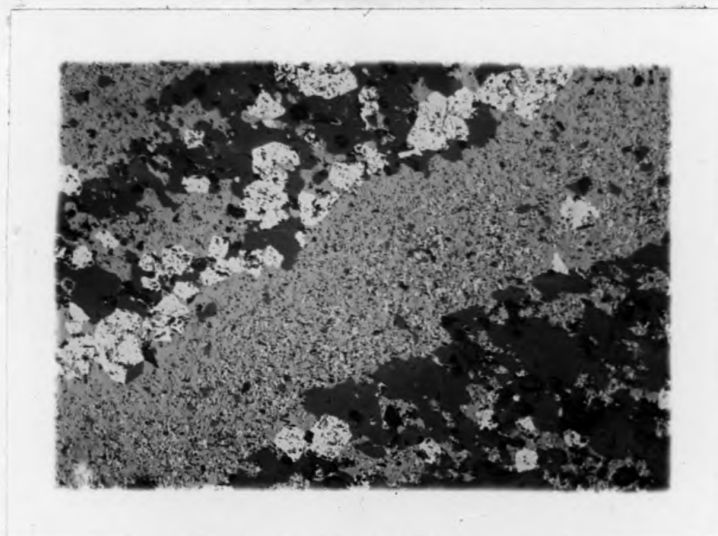
Hole No. 8. Depth 199-304'.

Polished Section No. 305

Photomicrograph No. 179.

Figure 18

North Lake



Showing the alternating layers of goethite and cherty goethite-martite.  
Martite, white; goethite, light grey; chert, dark grey; and pit, black.

Magnification: 125

Martite ore size: -plus or minus 325 mesh.

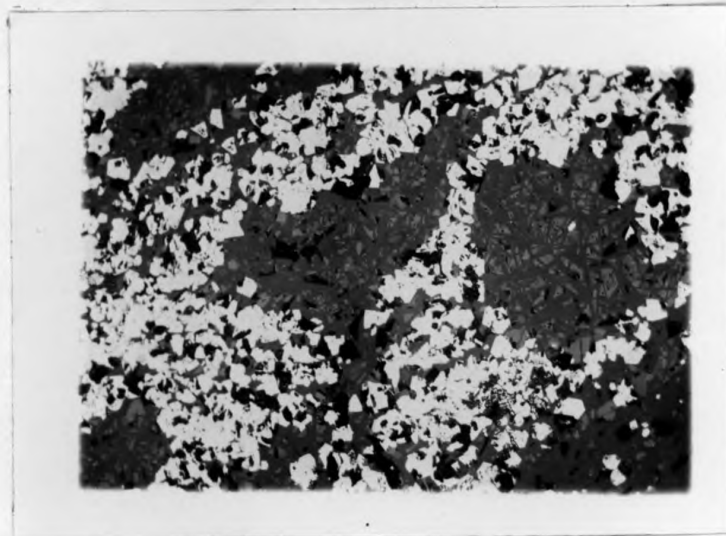
Hole No. 46, Section 4. Depth 505'.

Polished section No. 402.

Photomicrograph No. 256.

Figure 19

Empire



Carbonate-silicate ore.

Showing the relationship between magnetite aggregates and carbonate silicate.  
Magnetite, white; carbonate, light grey; silicate plates, grey; and pits, black.

Magnification 125

Ore Size: -400 mesh.

Hole No. 1. Depth: 1550'.

Polished section No. 359

Photomicrograph No. 237.



