

welfare Dept.      Annual Report      Year 1945.

23.

g. GWINN ASSOCIATION (Continued)

Basketball Games (Continued)

Boys High League and tournament	75 games
Girls High league	21 games
Junior Boys	22 games

Attendance at all home games . . . . . 4305.

Boys and Girls Senior High School class periods 49; attendance 272.

Attendance at all outdoor recreations, including activities at different locations, school playground and small playground at club; covering softball, hardball, touch football, and horse-shoe pitching. During the latter part of the season when many of the men were being discharged from service regular scheduled games were held at the school playgrounds. Attendance at all outdoor events . . . . . 8500.

There was no interest whatever in tennis, no doubt the inability to secure equipment, shoes, balls and rackets, was the chief cause.

Girl Scouts.

During the year the Troop Committee abolished the system of using paid leaders and now have voluntary leaders. All meetings continue to be held at the Club House.

The Troop was active in many projects and the leaders are to be commended for their efforts and time given to this worth-while program.

- 50 meetings - attendance 1070.
- 7 hikes for pleasure or nature study.
- 3 outdoor lunches.
- 3 dinner parties.
- 2 special social events.
- 2 bike trips
- 1 card party to raise funds.
- 1 Overnight camping trip.
- 2 skating parties.

Troop observed Scout Week by attending Church services in a group; assisted in raising funds for the polio and cancer drives by collecting at local theatre; made articles for trays for patients at Ishpeming Hospital; donated two boxes of toys for children at Good Will farm; assisted with Memorial Day services and held the annual Scout Ceremonial with parents and friends as guests. Held annual camping trip at Bass Lake Cottage.

Boy Scouts:

During the year a troop for boys was organized with the local Sportsmen's Association as sponsors. Efficient voluntary leadership directs the activity and the leaders are enthused over the progress made in reviving interest in scouting for boys in the district.

Meetings are held in the Club building and 16 meetings have been held since they organized.

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B. g.

GWINN ASSOCIATION (Continued)

BASS LAKE:

The cottage was opened May 24th and closed October 31st.

It was impossible to secure an estimated attendance of the number of people that made use of the grounds, boats, and bathing facilities due to the fact that gas rationing was in effect most of the season and employees of the Club were unable to travel. However, during the summer 37 trips were made to inspect the grounds and clean the cottage.

Three boats were in service during the season but on closing day only two boats were located; it may be possible to locate the missing boat early in the spring.

<u>Summary - Actual Use of Cottage.</u>	<u>Attendance</u>
Ex-Servicemen's annual supper	38
School and church picnics (7)	240
Cottage used 3 times by families for one week	23
Cottage used 6 times by families from 2 to 5 days	38
Girl Scouts used cottage 4 days	12
Negaunee Band Picnic - one day	30
Sportsmen's Rabbit Supper	55

Building:

The Clubhouse continues to operate under the same financial arrangements as in previous years. The Cleveland-Cliffs Iron Company renders financial assistance and supervision, the Cliffs Power and Light Company grants free service, and the local Board of Education, under a contract agreement, pays rental for the use of the building and equipment for their physical training program and for social activities including dancing.

The usual amount of attention was given the building such as varnishing floors in the lobby, recreation room, and community meeting room to keep them in good condition. The gymnasium was given a special coat of gym seal.

Bowling alleys were re-finished and new pins purchased. Janitor supplies and fuel purchased.

Arrangements are being completed to permit members of the American Legion use rooms as quarters for their meetings and also to provide space for a small kitchen.

The financial condition of the Club is at the lowest point in many years but those in charge hope to correct this situation to some extent, due to the fact that the Club will secure from the local Board of Education some fuel to off-set work being done for them in supervising their physical training program. The membership should also increase this coming year as many men who were in service are returning home.

23.

h. ISHPEMING Y.M.C.A. BUILDING

For the past few years we have continued to mention the Ishpeming Y.M.C.A. building in our annual reports. Very little in addition to what has been reported in previous years can be added. The Ishpeming Industrial Association has been interested in re-opening the building as a sort of community center.

As has been pointed out in my annual report before, the need for the re-opening of the Y.M.C.A. is still somewhat doubtful. Certainly there should be some type of program definitely organized on a community needs basis before the building is re-opened. In other words, if the right kind of program can be organized in the community, undoubtedly the Y.M.C.A. building can be used to advantage. It seems unreasonable, however, to open the building merely for the sake of having a community building. The re-opening of this building should depend entirely upon a well organized and planned program.

23.

1. SAFETY WORK

During the year the Central Safety Committee held a number of meetings under the direction of Mr. A. J. Stromquist, Safety Director. During the present year Mr. Stromquist has given out a brief review of all accidents previous to the meeting and a general discussion is had at the meeting and a study is made of the possibility of preventing like accidents in the future. Each accident is classified. During 1945 meetings were held on the following dates:

March 12  
 June 15  
 November 2  
 December 12  
 December 27

The safety meetings are held on the third floor of the main building, which we call our assembly room. The meetings generally last two or three hours and every effort is made to get a clear picture of the accident. The discussion is recorded and minutes are prepared and sent out to the members of the committee. Constant stress is placed on the need for creating and continuing good safety practices and for the prevention of accidents.

The following are members of the committee:

H. O. Moulton, Chairman  
 C. J. Stakel  
 C. W. Allen  
 Carl Brewer  
 Walter F. Gries  
 A. J. Stromquist  
 W. E. Johnson  
 H. F. Rogers  
 J. D. Preston  
 L. C. Moore  
 E. D. Cory  
 Grover Holt  
 F. J. Haller  
 Onnie Marjama  
 S. W. Sundeen  
 Ernest Keast  
 W. R. Atkins  
 John Trosvig  
 J. S. Westwater  
 Curtis Sundeen  
 H. W. Sundberg  
 Dr. George McL. Waldie  
 Captain Richard Cattran

A regular report of the Safety Department will be found in Mr. Stromquist's report.

23.

j. HOSPITALS AND MEDICAL SERVICE

The Superintendent of the Welfare Department acts in the capacity of Administrator of the Ishpeming Hospital and maintains almost daily contact with the Ishpeming Hospital and the Negaunee Dispensary. Occasional trips are made to the Iron River District and contacts are made with the General Hospital Company of the Iron River District at Stambaugh. The Ishpeming Hospital Advisory Committee has continued to meet the second Tuesday of each month and the following men make up the committee: Mr. C. W. Allen, Assistant Manager; Mr. E. E. Riedinger, Chief Clerk; Mr. Walter F. Gries, Superintendent, Welfare Department. At each meeting Dr. A. W. Erickson, Chief of Staff, is present, as is Mrs. Margaret Berg, Superintendent of the hospital.

Visits are made to the Gwinn District several times a year. Contacts are made there with the doctor and with the work of the Gwinn Dispensary. In Iron River we contact Dr. L. E. Irvine who takes care of our medical needs in that area. Each year the Superintendent of the Welfare Department attends the annual meeting of the Board of Directors of the General Hospital of the Iron River District at Stambaugh.

On January 1, 1944 the monthly medical fee was raised to \$1.50 and that fee has been in force for the past two years.

We succeeded in adding to our medical staff during the year. Dr. Treshler, who was last stationed at Gwinn, left our service during the year and we were fortunate in securing the services of Dr. R. G. Williams, a young surgeon from Ford Hospital in Detroit. Dr. Williams has made a very profound professional impression upon the community. At Gwinn we now have the services of Dr. S. J. Green who was formerly connected with the General Motors Corporation at Tarrytown, New York. Dr. Green is being very well received in the Gwinn area. Dr. R. L. Paine, who formerly was stationed at Negaunee and entered the military service in 1942, returned late in the year and has resumed his practice at Negaunee.

Dr. R. A. Burke of Negaunee continues to care for the medical needs of the Cambria-Jackson employees. Many of the Cambria-Jackson employees go to Dr. Mudge or Dr. Paine for services and the need for Dr. Burke's services are not as great as they were in the past.

ISHPEMING HOSPITAL

The Ishpeming Hospital has had a very active year during 1945. Service has been extended not only to our own employees and their families but to the community at large and to other communities outside the district. The hospital continues to maintain its high standard and has again been granted membership in the American Hospital Association and in the American College of Surgeons.

Mrs. Margaret Bilkey Berg, a local person who has had many years of service in the Ishpeming Hospital, is now serving as Superintendent. For most of the year we were fortunate in being able to maintain a good staff of nurses. At the close of the year, however, the situation with respect to nurses became quite serious

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j. HOSPITALS AND MEDICAL SERVICE (Continued)

and we anticipate that we shall have difficulty maintaining a staff as large and as efficient as we had during the early part of the year. Many of the married nurses who assisted us during the war years have left the hospital since their husbands have returned from the military services. At the writing of this report we are definitely short of nursing personnel.

It has been our policy to mention in each annual report the fact that people of this community and surrounding communities do not fully appreciate the real value of the Ishpeming Hospital as a community asset. The hospital is owned, operated, and maintained entirely by the Cleveland-Cliffs Iron Company, with the assistance of cooperating and coordinating companies in the district. The community does not contribute to the hospital in any way. The lack of appreciation of the hospital is not a conscious thought on the part of our people since I feel that most people in this community feel that the Cleveland-Cliffs Iron Company is making a very great contribution to the general welfare and health of the entire community through the services rendered by the Ishpeming Hospital and our medical staff and nurses. In many communities of the size of Ishpeming and Negaunee obligations are placed upon the community in connection with the support and maintenance of hospitals.

It is our contention that the Ishpeming Hospital, without doubt, is the best channel we have for the creation of good will and good public relations in the community. Many times persons who are obliged to enter a hospital report after attention at the Ishpeming Hospital that they are very grateful for the services rendered. Patients recognize, after being hospitalized at the Ishpeming Hospital, that the hospital is well equipped and that it renders an outstanding service. This attitude on the part of persons over the years is, of course, an asset to the company.

At various times the possibility of a re-organization of the hospital has been discussed. I feel that this should be done but that absolute control of the hospital should be kept by the Cleveland-Cliffs Iron Company. The great service which is rendered in connection with compensation and injury cases is a problem which the company should always be in position to guide and control. The hospital should be organized as a non-profit institution since we are now compelled to pay Michigan state sales tax. It is felt that the medical staff should be definitely disengaged from the hospital. Our doctors should organize and establish their own organization and practice as such.

The Hospital Advisory Administrative Committee, which has met almost monthly for the past few years, has had an opportunity to familiarize itself with some of the problems which arise in the conducting of the business of a hospital. The committee has been very faithful and attentive to the needs of the hospital. The functioning of this committee makes it possible for three individuals employed in executive capacities of the company to know something about the problems and the cost of operating a hospital.

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j. HOSPITALS AND MEDICAL SERVICE (Continued)

The staff of the Ishpeming Hospital during the year 1945 was made up of the following:

Dr. A. W. Erickson, Chief of Staff  
 Dr. P. P. Hartt  
 Dr. R. G. Williams (transferred in December from the  
 Negaunee Dispensary)

At one time we had five doctors at the Ishpeming Hospital but in recent years we have not had more than three. It was practically impossible to maintain a medical staff of five during the war years and it now appears that the three doctors in Ishpeming, while very busy, can take care of the medical needs of our people in that area.

The staff at the Negaunee Dispensary is made up of the following:

Dr. W. A. Mudge  
 Dr. R. L. Paine

Dr. Treshler, who was at Gwinn during the last few months of his service, resigned in August and he has been replaced by Dr. S. J. Green. Dr. Green lives at Gwinn and has his office there.

Dr. R. A. Burke, who has his own hospital in Negaunee, continues to serve our Cambria-Jackson employees by agreement. Dr. Burke is paid \$1.50 per man per month for each of the Cambria-Jackson employees for medical and we also supplement this with \$1.00 per man per month to assist Dr. Burke in caring for accidents and injuries and in the maintenance of his own hospital.

The Ishpeming Hospital was opened in 1918. During the year the hospital continued to give the best possible type of hospital and medical service. The hospital, while a department of the company, is operated as a separate unit of business and it is supervised by the Welfare Department. The Superintendent of the Welfare Department acts as Hospital Administrator and keeps in constant touch with the hospital.

A review of the enrollment at the Ishpeming Hospital over recent years indicates that the Ishpeming Hospital is gradually rendering more service each year. It has taken care of the needs of the people of this community, although at times in recent years facilities became inadequate because people have been more hospital conscious than they formerly were. We provide for the care of our own people first and two beds are always reserved for accidents and injuries regardless of what other conditions may be. At the present time we are listing the hospital as having a capacity of 52 beds and 20 bassinets. There is a closed medical staff, a complete nursing staff and we engage only graduate nurses. There is no nurses' training school in connection with the hospital.

During the year considerable was spent in the hospital by way of improvement, replacement and equipment. Eighteen thousand dollars or more of the deficit of 1945 is due to the need for redecorating, replacement and additions

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j. HOSPITALS AND MEDICAL SERVICE (Continued)

of equipment. The hospital is very well equipped with x-ray apparatus, laboratory facilities, surgical equipment, operating room equipment, obstetrical rooms, as well as excellent equipment for all accidents and injuries and for diathermy treatments. The emergency room on the first floor of the hospital is a very busy place. Practically all minor injuries of both our own employees and the outside practice are cared for in the emergency room.

The admission and enrollment statistics of 1945 show definitely that the hospital has been fully utilized. Each year we try to point out in our annual report that the future needs of the community probably cannot be taken care of at the Ishpeming Hospital unless additional space is provided. This is due to the fact that many people outside of our own company are carrying group hospitalization insurance and many more people are going to hospitals now than ever before. The increase in the number of obstetrical cases in the hospital indicates that practically all obstetrical cases now are taken care of in the hospital rather than at home. We are maintaining at the present time two obstetrical departments. In the report for 1944 we mentioned the battery of three rooms formerly used as nurses' quarters being remodelled and made over for a second floor obstetrical department.

The hospital building has been kept in good condition. During the year we have replaced with wood tile some of the old ceilings which have been patched for years. The covering of the ceilings with wood tile has eliminated all the difficulty we have had with cracked and falling ceilings, which difficulty has been experienced over many years.

The Ishpeming Hospital accounts receivable balance as of December 31, 1945 is \$23,381.06. The operating revenue for the twelve months of 1945 was \$71,936.65. The uncollectible accounts for 1945 amounted to \$1104.17. During 1945 the hospital collected 98.46 cents out of every \$1.00 worth of work done.

The Welfare Department as a whole and the Administrator of the hospital wish to record here their appreciation to the participating companies in the district for the cooperation and support they have given the Ishpeming Hospital.

A special report is attached to this general report, giving information regarding the operation of the Ishpeming Hospital for 1945.



WELFARE DEPT. ANNUAL REPORT YEAR 1945

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j. HOSPITALS AND MEDICAL SERVICE (Continued)GOVERNING BOARD

E. B. Greene, President  
 C. J. Stakel, Manager  
 Walter F. Gries, Superintendent, Welfare Department

ADVISORY COMMITTEE

C. W. Allen, Assistant Manager  
 E. E. Riedinger, Chief Clerk  
 W. F. Gries, Secretary and Administrator

ACTIVE MEDICAL STAFF

A. W. Erickson, M.D., President	G. McL. Waldie, M.D.	
P. P. Hartt, M.D.	R. G. Williams, M.D.	(1)
W. A. Mudge, M.D.	S. J. Green, M.D.	(2)

COURTESY STAFF

P. Van Riper, M.D.  
 I. Sicotte, M.D.  
 F. O. Paull, M.D.

CONSULTING STAFF

A. W. Erickson, M.D.

DEPARTMENTSLaboratory and Roentgenology

A. W. Erickson, M.D.

Anesthesia

P. P. Hartt, M.D.

Gwinn Dispensary

H. J. Treshler, M.D. (3)  
 S. J. Green, M.D. (4)

Histories

A. W. Erickson, M.D.

Negaunee Dispensary

W. A. Mudge, M.D.  
 R. G. Williams, M.D.  
 H. J. Treshler, M.D. (3) (4)

Industrial Hygiene

Geo. McL. Waldie, M.D.

- (1) Joined staff August 6, 1945
- (2) Joined staff, Gwinn Dispensary, December 1, 1945
- (3) Resigned August 31, 1945
- (4) To Gwinn Dispensary from Negaunee Dispensary February 19, 1945

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23. j. HOSPITALS AND MEDICAL SERVICE (Continued)

ISHPEMING HOSPITAL  
STATISTICAL REPORT FOR THE YEAR 1945

Number of patients remaining in the hospital at beginning of year		31
Number of adult patients admitted	890	
Number of child patients admitted	142	
Number of births	<u>283</u>	
Total new patients for year 1945		1315
Total of all patients for year 1945		1346
Number of deaths	74	
Number discharged during year	<u>1234</u>	
Total number leaving hospital		1308
Number of patients remaining at the end of the year 1945		38
Classification of new cases:		
Newborn	283	
Surgical	348	
Medical	375	
Obstetrical	<u>309</u>	
Total		1315
Number of operations:		
Major	116	
Minor	223	
Circumcisions	<u>117</u>	
Total		456
Number of emergency room operations		388
Number of patient days:		
Baby days	2635	
Others	<u>13055</u>	
Total		15690
Average number patients per day		42.98
Average stay per patient days		11.36
Number of meals for patients		39165
Number of meals, others		19929
Total number of meals		59094

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j. HOSPITALS AND MEDICAL SERVICE (Continued)DEATHS FOR 1945 CLASSIFIED BY DISEASE

Addison's disease.....	1
Anuria.....	1
Arteriosclerosis.....	4
Bronchitis.....	1
Burns, extensive third degree.....	1
Carcinoma, bronchus.....	1
Carcinoma of the colon.....	2
Carcinoma of the neck.....	1
Carcinoma of the left breast.....	1
Carcinoma of the stomach.....	2
Cardio renal.....	2
Cardio vascular failure.....	2
Cirrhosis of the liver.....	1
Coronary occlusion.....	5
Coronary thrombosis.....	3
Decompensated heart.....	2
Diabetes.....	1
Embolism.....	1
Embolism, cardiac.....	1
Embolism, cerebral.....	2
Fracture, basal skull.....	2
Heart failure, acute.....	1
Hemorrhage, cerebral.....	4
Hypertension.....	3
Hypertrophy, congenital of liver.....	1
Intestinal obstruction.....	2
Myocarditis.....	6
Peritonitis.....	2
Pneumonia.....	3
Pneumonia, broncho.....	2
Premature.....	6
Stillborn.....	6
Terminal infection.....	1
Total	74

WELFARE DEPT. ANNUAL REPORT YEAR 1945

23. j. HOSPITALS AND MEDICAL SERVICE (Continued)

DEATHS DURING THE YEAR 1945

Surgical.....6  
 Medical.....51  
 Traumatic Injuries.....1  
 Newborn.....7  
 Stillborn.....6  
 OB's Delivered.....3

Total 74

Deaths under 48 hours.....27  
 Deaths over 48 hours.....41  
 Stillborn.....6

Total 74

TRAUMATIC DEATHS

<u>Case No.</u>	<u>Patient</u>	<u>Age</u>	<u>Diagnosis</u>
25376	John Carlson	70	Coronary occlusion. Fracture, right ulna and right tibia and fibula about February 6, 1945.

NUMBER OF FRACTURE CASES DURING 1945

Cleveland-Cliffs Iron Company 73  
 Outside Cases 68  
 Inland Steel Company 10  
 Hercules Powder Company 3  
 Oliver Iron Mining Company 4

Total 158

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j. HOSPITALS AND MEDICAL SERVICE (Continued)

LABORATORY REPORT FOR 1945

Blood Sugar.....	3
Blood Cultures.....	4
Coagulation Time.....	132
Differential Count.....	515
Feces.....	57
Gastric Contents.....	12
Haemoglobin-Haden Hausser.....	1407
Parasites and Ava.....	5
Red Cell Count.....	1374
Smears.....	91
Special Blood Exam.....	2
Spinal Fluid to Houghton.....	3
Sputum to Houghton.....	8
Blood Chemistry to Houghton.....	56
Urine to Houghton.....	1
Urinalysis.....	3749
Sedimentation.....	95
Miscellaneous Exams.....	276
Leucocyte Count.....	1033
Blood Typing.....	111
Blood Matching.....	65
Vena Punctures for Kahns.....	193
Glucose Tolerance.....	6
Bleeding time.....	2
Sulfa Level.....	57
Hematrocite.....	4
Pregnancy Tests.....	5
Widal.....	1
Throat Swabs.....	2
Pleural Fluid to Houghton.....	1
Blood Chemistry.....	138
R H. Factor.....	32
Icterus Index.....	20
Prothrobin.....	1
Sputum.....	14
	<u>9375</u>

Pathological Specimens to Ann Arbor.....203  
9578

WELFARE DEPT. ANNUAL REPORT YEAR 194523. j. HOSPITALS AND MEDICAL SERVICE (Continued)TREATMENTS FOR THE YEAR 1945

Basal Metabolism.....	91
Ultra-violet Ray.....	355
Infra-Red.....	851
Diathermy.....	1973
Dressings.....	90
Cautery.....	60
Massage.....	436
Water Bath.....	52
Intra-muscular Injections.....	26
Subcutaneous Injections.....	<u>4</u>

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DEPARTMENT OF INDUSTRIAL HYGIENE

January, 1945 to December, 1945

Blood Sugar.....	1
Differential Count.....	221
Haemoglobin-Haden Hausser.....	2507
Urinalysis.....	2505
Sedimentation.....	2512
Leucocyte Count.....	2510
Vena Punctures for Kahns.....	2505
Blood Chem. to Houghton.....	7
Blood Chemistry.....	6
Red Blood Cell.....	80
Glucose Tolerance.....	1
300 counts.....	5
Miscellaneous.....	<u>5</u>
	12,907

EKG of Hercules Powder Company.....	<u>42</u>
	12,949

23. j. HOSPITALS AND MEDICAL SERVICE (Continued)X-RAY REPORT FOR 1945

Extremities.....	692
Shoulder.....	82
Spine.....	114
Ribs.....	45
Skull.....	20
I.V. Pyeolograms.....	3
Kidney.....	33
Pelvis.....	41
Stomach.....	32
Fluoras.....	5
Foreign Body.....	15
Colon.....	8
Mastoid.....	1
Abdomen.....	2
Chest.....	117
Jaw.....	4
Fetus.....	57
Gall Bladder.....	53
E.K.G.....	110
Orbits.....	<u>1</u>
Total	1436

No. of Out Patients.....	354
No. of In Patients.....	<u>1097</u>
Total	1451

SARANAC INVESTIGATION

Chest.....	2192
Miscellaneous.....	<u>96</u>
Total	2288

23.

j. HOSPITALS AND MEDICAL SERVICE (Continued)DIETARY REPORT--ISHPEMING HOSPITAL--YEAR 1945

Patients' Meals.....	39165
Doctors, Nurses, Employees, Visitors.....	19929
Total Meals for the Year.....	59094
Formulas.....	283

## Special Diet--Patient Days:

Low Fat.....	212
Bland.....	169
Special Soft.....	72
Diabetic.....	312
Post-Operative Gastric Ulcer.....	7
Neutral.....	184
Dry.....	5
Final Ulcer.....	19
Reduction.....	50
Initial Ulcer.....	23
Salt Poor.....	63
Nephritic.....	25
High Carbohydrates, Low Fat, Low Protein.....	121
Modified Sippy.....	58
Allergy.....	14
Low Residue.....	3
High Caloric.....	13
Salt Free.....	40
High Protein, High Carbohydrate..	2
Ulcer.....	31
Low Salt, Low Protein.....	2
High Fiber.....	4
Selective.....	212
Sippy.....	68

Total Special Diet Patient Days.....	1709
Total Special Diet Meals.....	5127



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j. HOSPITALS AND MEDICAL SERVICE (Continued)

Total Minor Operations.....251

Tonsillectomy.....19  
 Tonsillectomy & Adenoidectomy.....57  
 Removal of Tonsil Tag.....1  
 Tonsillectomy, adenoidectomy, circumcision.2  
 Adenoidectomy.....1  
 Adult circumcisions.....11  
 Tooth extractions.....4  
 Blood transfusion.....46  
 Dilation and curettage.....36  
 Dilation & curettage with cervical  
   cauterization.....1  
 Dilation.....2  
 Steinman pin insertion.....2  
 Kirschner wire insertion.....6  
 Removal of Kirschner wire, cast applied.1  
 Skin graft.....4  
 Vaginal exam.....1  
 Cervical exam.....1  
 Removal cervical polyp.....1  
 Removal uterine pack.....2  
 Incision & drainage.....4  
 Incision & drainage of sub-periosteal  
   abscess.....1  
 Neck abscess, incision & drainage.....3  
 Excision finger nail.....1  
 Repair anal fistula.....1  
 Hemorrhoidectomy.....6  
 Right thoracentesis.....1  
 Perineorrhaphy.....1  
 Perineorrhaphy, uterine suspension.....1  
 Perineorrhaphy, removal hemorrhoid.....1  
 Spinal puncture.....3  
 Removal right breast nodule.....1  
 Right breast amputated.....1  
 Saphenous ligation.....3  
 Removal sebaceous cyst.....2  
 Removal scar tissue left breast.....1  
 Pilaroidal cyst.....1  
 Removal scar tissue from left knee.....1  
 Muscle transplanted from left leg to  
   left breast.....1  
 Reduction of fracture left thumb.....1  
 Repair of tendons left hand, compound  
   fracture, cast applied.....1  
 Tendon repair.....4  
 Closed reduction, cast to left arm.....1

Cast left leg.....1  
 Cast right arm.....1  
 Open reduction, external condyle left  
   humerus.....1  
 Open reduction, small toe left foot.....1  
 Open reduction, 2nd, 3rd and 4th  
   metatarsals, left foot.....1  
 Open reduction left arm.....1  
 Removal of semi-lunar cartilage,  
   right knee.....1  
 Repair left thumb laceration.....1  
 Repair of traumatic amputation, left  
   index finger.....1  
 Amputation, two toes.....2  
 Amputation index and 3rd fingers, rt. hand.1

Total Major Operations.....93

Appendectomy.....47  
 Appendectomy, rt. ovary punctured.....1  
 Appendectomy, removal of gangrenous  
   omental appendage with twisted  
   pedicle.....1  
 Caesarean Section.....9  
 Herniotomy.....13  
 Herniotomy & Appendectomy.....2  
 Bilateral Hernia.....1  
 Inguinal Hernia.....1  
 Umbilical Hernia.....1  
 Strangulated Hernia.....1  
 Exploratory laparotomy.....7  
 Laparotomy, repair gunshot wound with  
   suturing of spleen.....1  
 Laparotomy, cystic ovary & appendectomy.1  
 Perforated ulcer.....1  
 Hysterectomy.....1  
 Cholecystotomy.....2  
 Cholecystectomy.....1  
 Ruptured Gall Bladder.....1  
 Cholecystectomy & appendectomy.....1

Total Infant Circumcisions.....117

WELFARE DEPT.      ANNUAL REPORT      YEAR 1945

23.    j.    HOSPITALS AND MEDICAL SERVICE    (Continued)

EMERGENCY ROOM REPORT

	<u>Company Cases</u>	<u>Outside Cases</u>	<u>Total Cases</u>
January	131	69	200
February	191	80	271
March	226	83	309
April	217	76	293
May	221	78	299
June	219	48	267
July	160	87	247
August	266	11	277
September	139	81	220
October	185	79	264
November	116	79	195
December	<u>105</u>	<u>88</u>	<u>193</u>
Total	2176	859	3035

	<u>Company Visits</u>	<u>Outside Visits</u>	<u>Total Visits</u>
January	334	202	536
February	427	131	558
March	438	139	577
April	421	132	553
May	422	188	610
June	349	72	421
July	288	191	479
August	341	36	377
September	220	233	453
October	368	326	694
November	299	190	489
December	<u>254</u>	<u>223</u>	<u>477</u>
Total	4161	2063	6224

j. HOSPITALS AND MEDICAL SERVICE (Continued)

	<u>JAN.</u>	<u>FEB.</u>	<u>MAR.</u>	<u>APR.</u>	<u>MAY</u>	<u>JUNE</u>	<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>TOTAL</u>
Patients Admitted	120	106	98	192	127	97	126	129	96	113	111	100	1315
Patients Discharged	100	101	116	87	115	125	124	115	97	110	107	111	1308
Number of Men	39	30	30	23	26	28	26	30	25	28	32	30	347
Number of Women	45	45	44	39	50	34	50	44	45	52	49	46	543
Number of Children	9	3	2	12	13	14	29	32	8	10	6	4	142
Newborn	27	28	22	18	38	21	21	23	18	23	24	20	283
Classified as:													
Newborn	27	28	22	18	38	21	21	23	18	23	24	20	283
Obstetrical	30	31	27	21	42	22	20	26	21	25	25	19	309
Medical	37	24	31	30	26	28	30	45	26	28	28	42	375
Surgical	26	23	18	23	21	26	55	35	31	37	34	19	348
Daily Average	41.45	47.78	45.54	42.4	50.2	43.1	38.87	37.00	4.16	44.58	46.43	37.09	478.60
Newborn Days	239	266	243	161	328	270	178	168	124	248	253	157	2635
Patient Days	1056	1112	1169	1112	1228	1024	1027	979	1081	1134	1140	993	13,055
Total Days	1295	1338	1412	1273	1556	1294	1205	1147	1205	1382	1393	1150	15,650
Operations:													
Emergency Room	25	33	31	36	20	22	52	23	35	37	14	25	301
Major	7	8	11	10	15	14	9	11	8	18	7	12	130
Minor	10	8	4	18	9	17	40	34	17	25	40	16	238

Note: 74 deaths included in discharges

23.

j. HOSPITALS AND MEDICAL SERVICE (Continued)NEGAUNEE DISPENSARY

The Negaunee Dispensary, formerly the Negaunee Hospital, continues to serve as the medical center for our employees in Negaunee. Dr. W. A. Mudge and Dr. R. L. Paine have their offices in the Dispensary building, as does Miss Ina Atkin, the industrial nurse for the Negaunee District. There are approximately 1300 employees in the Negaunee area and most of them have their medical needs taken care of through the Negaunee Dispensary. (Dr. R. L. Paine who had been in the Navy for three years returned to his practice in Negaunee during the second week in January, 1946.) We also have two regular nurses at the Dispensary in Negaunee. They assist the doctors and take care of the Dispensary work. Regular visits are made to the Negaunee Dispensary two or three times each week and conferences are held regularly with the doctors and the nurses.

Dr. R. A. Burke, who has his own hospital, the Twin City Hospital at Negaunee, continues to serve as the doctor for the Cambria-Jackson employees. By agreement with the company Dr. Burke receives the \$1.50 per month which the Cambria-Jackson employees pay for medical services and he also receives \$1.00 per month per employee for his hospital. Each year we note that more and more of the Cambria-Jackson employees are going to the Negaunee Dispensary for medical service.

The Negaunee Dispensary, in addition to being the medical center and the offices for our doctors in the Negaunee District, also serves as an emergency hospital or clinic for injuries which do not need to be brought to the Ishpeming Hospital. No cases are hospitalized at the Negaunee Dispensary but many slight injuries are taken care of there.

The living quarters in the Negaunee Dispensary are occupied by Mr. John Roberts, the custodian and janitor of the building. Mr. Roberts keeps the building in good shape, takes care of the fires, unpacks the supplies and materials and takes care of the doctors' and nurses' cars.

GWINN DISTRICT

Dr. H. J. Treshler, who moved from Negaunee to Gwinn during the summer of 1945, left our employ late in 1945 and he was succeeded by Dr. S. J. Green. Dr. Green is giving full time to the medical needs of our employees in the Gwinn area. He lives in the home which the doctor has always occupied and in which he has his office and dispensary. While a full time doctor is in service at Gwinn we do not maintain an industrial nurse. We have had an industrial nurse at various times when we did not have a full time doctor for the Gwinn area. Dr. Green comes to us from Tarrytown, New York where he was formerly employed by the General Motors Corporation. He likes it very well in Gwinn and he seems to be getting along splendidly.

23.

j. HOSPITALS AND MEDICAL SERVICE (Continued)REPUBLIC HOSPITAL

Each year we include a paragraph in our annual report on the building which was formerly known as the Republic Hospital. This building is now under the supervision of the Republic Township Board. Dr. Van Riper of Champion, who cares for our medical needs in the area, uses the Republic Hospital daily as an office and as sort of a health center. The maintenance of medical service at the old Republic Hospital is a great convenience to the people of Republic and the surrounding area.

Presently, the Republic Township Board and the Republic Township School District are cooperating in an effort to keep the old Republic Hospital open so that there will be some type of medical and health service in Republic and the surrounding area. The Township Board requested some time ago, through their supervisor, Mr. Joseph Labold, that the company sell the old hospital building to the Township Board. At any rate, the building should be leased to the Township Board so that health services may always be available to the community.

The Republic Township Board engages a registered nurse, a married person, who, as part of her remuneration, is granted the use of an apartment in the hospital building. The nurse is on duty to assist Dr. Van Riper and to give attention to emergency cases. The arrangement appears to be a very good one.

IRON RIVER HOSPITAL

During 1945 several visits were made to the General Hospital of the Iron River District at Stambaugh. We receive a monthly report from the Iron River Hospital and we make an effort each year to attend the annual meeting. The General Hospital of the Iron River District cares for the medical and hospital needs of our employees at the Spies-Virgil Mine at Iron River. The annual meeting this year was attended by Walter F. Gries, Superintendent of the Welfare Department, and Onnie Marjama, Superintendent of the Spies-Virgil Mine. The Iron River Hospital is managed by a board of trustees and the hospital is administered in a very business-like manner.

Dr. L. E. Irvine of Iron River continues to provide medical attention for our Spies-Virgil employees. He also gives the physical examinations, both pre-employment and periodical for our Spies-Virgil men. Dr. A. L. Haight at Crystal Falls cares for a small group of our employees who request his services in the Crystal Falls area.

23.

j. HOSPITALS AND MEDICAL SERVICE (Continued)PAYMENTS TO PHYSICIANS

For reference purposes the following statement is made in each annual report:

On August 1, 1927, a new rate of payment for the Cleveland-Cliffs Iron Company went into effect. The employees pay \$1.25 for medical services for themselves and the dependent members of their families and the Company pays 50¢ per man per month to cover medical and hospital services for cases coming under the Compensation Act.

We wish to note in this annual report that the rates described in the preceding paragraph have now been changed. These new rates became effective January 1, 1944. The monthly rate was raised from \$1.25 to \$1.50. Employees, therefore, are now paying \$1.50 per month for medical attention for themselves and the dependent members of their families. The Company has increased its contribution from 50¢ per man per month to 75¢ per man per month to cover medical and hospital services for cases involving injuries and accidents.

PHYSICAL EXAMINATION OF EMPLOYEES

We have had a contract with the Trudeau Foundation of Saranac Lake of New York which has continued since 1934 until October of 1945. We have dispensed with the Trudeau Foundation services since we now feel that our own Industrial Hygiene Department can take care of our needs very well. The Employment Department schedules regular physical examinations for employees for each working day and it has been our policy for some time in the past to schedule twelve men for each day. Copies of this schedule are filed with the Welfare Department and the results of the physical examinations are also reported to the Welfare Department and a record is kept in the file of each employee.

Mr. E. Clayton Quinn, who was formerly employed by Saranac Lake in the Northern Peninsula and who returned from military service in September of 1945, has accepted the position of industrial technician in our Industrial Hygiene Department. Mr. Quinn succeeds Mr. Sidney Hodson who was associated with the Trudeau Foundation and formerly assigned to Ishpeming. Mr. Quinn is very well trained and qualified to assist Dr. Waldie in our Industrial Hygiene Department.

INDUSTRIAL HYGIENE DEPARTMENT

The Industrial Hygiene Department was organized on April 1, 1939. Dr. George McL. Waldie continues to have charge of the department. We feel that our Industrial Hygiene Department is capable of carrying on very well without the regular, constant services of Saranac Lake. We have continued the usual physical examination program and particularly during the war years was this service valuable because of the fact

23.

j. HOSPITALS AND MEDICAL SERVICE (Continued)

that a careful screening was necessary, particularly in pre-employment examinations. Dr. Waldie has accumulated considerable valuable information over the past several years with respect to our employees, which makes it possible for him to have a very definite knowledge of the many cases which come to his attention and which require special consideration.

The work of the Department of Industrial Hygiene has become expanded because the Saranac contract was not renewed. Since November 1, 1945 no films have been sent to Saranac for interpretation and since December 21 our x-ray technician has replaced the one previously furnished under the contract.

Dr. Waldie now is reading all chest x-rays of the Cleveland-Cliffs Iron Company, the Inland Steel Company, and the North Range Mining Company employees on the Marquette and Menominee Ranges. In addition, his department will add to the data previously developed under the Saranac contract and will continue to furnish statistical information for the benefit of the several companies.

The work done for the North Range Company will be a new part of the department's routine, as will that done for the Sherwood Mine of the Inland Steel Company. It is intended to develop a closer relationship between the x-ray findings and the clinical observations on the employees at the Menominee Range properties of the Cleveland-Cliffs Iron Company and Inland Steel Company than has been possible in the past. The service contracted for by the North Range Company is limited to chest x-ray interpretations.

Believing that discussion of medical examination findings increases the value of the periodic check-up to the employee, the following has been printed on the appointment slip: "You are encouraged to discuss your examination findings with the doctor. Ask questions."

Correction of defects continues to be the aim of the department, and it is ever stressed that the health program is primarily of benefit to the employee.

We continue to give special attention to many cases which require follow-up work. Dr. Waldie generally refers these special cases to the employee's regular physician and a check-up is made from time to time to determine whether or not progress is being made and whether the individual employee has recovered sufficiently to return to work or to determine whether he is following the course of treatment set up by the attending physician.

The physical examinations which our employees take are arranged so that as little time as possible is lost from the regular working assignment of the individual employee. For some time we have been hearing objections on the part of our employees to our physical examination program since there are some who feel that physical examinations should be made on company time. We have continued, however, to try to examine employees on their own time. We have a few cases where men are working on day shift all the time and we find it necessary to examine these men and to give them some time allowance from their regular work.

23. j. HOSPITALS AND MEDICAL SERVICE (Continued)

The following number of examinations have been conducted through December 31, 1945:

Cleveland-Cliffs Iron Company	19,434
Inland Steel Company	3,241
Republic Steel Company	1,653
North Range Mining Company	1,237
Oliver Iron Mining Company	725
Pickands Mather & Company	149
M. A. Hanna Company	199
Hercules Powder Company	155
Calumet & Hecla Company	29
Marquette County Road Commission	<u>10</u>
Total	26,832

We have had a shortage of manpower during the war years. Presently, if the mines were working, 200 or more men, particularly miners and underground laborers, could be employed. It is interesting to note that during the year over 150 World War II veterans returned and either resumed work with our company or started to work for the first time for the company.

Each year we feel that more of our employees realize the value of the Industrial Hygiene Department and its services to them. Occasionally there is objection to suggestions made by the Industrial Hygiene Department and by Dr. Waldie because sometimes it becomes necessary, for the best interests of the individual, to demand that certain procedures and treatments be followed. We urge employees to discuss with Dr. Waldie the result of physical examinations and we also encourage employees to contact the Industrial Hygiene Department, as well as the Welfare Department, when health problems arise.

Under a new Michigan Occupational Disease Act it is now necessary to inform each employee following examination if the examination indicates by x-ray any presence of what might be termed "nodulation". We have decided to use one of our regular forms in reporting to the individual employee and the nature of the phraseology has been gone over with our attorney, Mr. Bell. We have agreed to use the terms which Dr. Waldie would normally use in his report and we have also determined that for the best interests of the individual who may receive a report calling attention to some chest condition, that such individual be called in for special consultation and explanation of the condition by Dr. Waldie. This new program is now in force.



23.

k. COMMUNITY HEALTH

Each year we include in the annual report a statement about general health conditions in Marquette County. For the year 1945 the general health conditions in Marquette County were very good. There were no epidemics nor has there been any great loss of time in industry because of prolonged illnesses of any kind. We have had, in late 1945 and running into the first part of 1946, what might have developed into an influenza epidemic. However, we were fortunate in that the epidemic did not develop. There was also some evidence of what the doctors referred to as "virus colds". The common cold still seems to be the greatest reason for loss of time. There was again evidence during the summer and early fall months of greater absenteeism but as far as we have been able to ascertain, this absenteeism was not due to illnesses but largely to the fact that men have been earning higher wages and sometimes there has been evidence of extended after pay day vacations.

Hospital statistics indicate a gradual increase in the use of the hospital and particularly during the winter months the enrollment at the Ishpeming Hospital has at times been above sixty. The other hospitals in the county inform us that they have the same experience. That is, that people are more hospital conscious than they have been and that hospitals are being used more than they were some few years ago.

Each city in Marquette County has a health officer and a full time school nurse. The County of Marquette also employs a full time nurse who spends much of her time in the township districts. The townships also have health officers.

The city health officers in Marquette County are:

Ishpeming	-	Dr. W. A. Corcoran
Marquette	-	Dr. C. P. Drury
Negaunee	-	Dr. N. J. Robbins

The Michigan Children's Fund, which is made available by funds provided by the late Senator James Couzens, has carried on its usual services, including the dental clinics during the summer months. Many children, particularly those in rural areas, were given dental attention.

The Northern Michigan Children's Clinic at Marquette, also supported largely by the Michigan Children's Fund, has carried out its usual functions and programs throughout the year, giving particularly fine service to sick and crippled children. This clinic is located at Marquette and operates in cooperation with St. Luke's Hospital. The Northern Peninsula counties are very fortunate that such a clinic is available, particularly because of the fine staff, fine equipment, and fine services which are available.

The Bay Cliff Health Camp was in session again this past summer, this being the eleventh year. 155 children were enrolled from the counties of the Northern Peninsula. These children are privileged to enroll in the health camp at Big Bay for six or seven weeks and each year the camp has endeavored to add some special type of service for children who are crippled, under-nourished or handicapped. I have continued to serve as Chairman of the Board of Directors during the past year. The results of the program at Bay Cliff Health Camp have been most gratifying.

welfare dept.      annual report      year 1945

23.

1. RED CROSS (Continued)Report of Nurse  
Marquette County Chapter  
American Red Cross.Home Calls:

Children needing eye examinations	20
Children with frequent sore throats	5
Children with defective hearing	6
Children with defective speech	4
Feeble-minded children	3
Rheumatic heart	68
Crippled Children	26
School home calls	123
Infant	16
Pre-School	25
Adult	43
Pre-natal	5
Post-natal	7

Other Calls:

School calls	110
Scarlet Fever	5
Chicken Pox	10
German Measles	20
Other infectious diseases	22
School Board members and lay helpers	32
County Supervisors	2
Social Welfare Office	47
Hospitals	4
Northern Michigan Children's Clinic	12
Physicians	41
Nurses	24
Nurses Aides	10
To different Social Agencies	14    14
Marquette City Health Department	6
Bay Cliff Health Camp	2

Teacher Consultations	222
Inspections of school children	449
Glasses issued to children through Children's Fund	3
Children examined at Cardiac Clinic	57
Children examined at U.P. Children's Center	6
Children examined at No. Mich. Children's Clinic	59
Children admitted to hospitals	6

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23.

1. RED CROSS (Continued)Report of Nurse. (Continued)

112 children from Marquette and Alger Counties were examined at the Bi-Annual Orthopedic Clinic, November 3rd. This figure included 18 Marquette County rural children.

Bay Cliff Health Camp:

Rheumatic heart cases	9
Hard of hearing	5
Speech defects	3

Immunization Clinics:

Smallpox vaccinations	428
First Diphtheria Toxoid	338
Second Diphtheria Toxoid	96
Complete Whooping Cough Shots	29

Assisted with physical examinations of 4-H Club boys and girls at Camp Shaw. Made 19 trips to U of M. Hospital, Ann Arbor; transported 14 men, 9 women, 1 boy and 1 girl; brought back to Marquette County 7 men, 3 women, and 1 baby. Brought one patient to St. Mary's Hospital.

Conveyed 15 children and three staff members to Bay Cliff Health Camp.

Interviews with State Nursing Consultants 5

Field trips with State Consultants 2

Three Health Educational films were shown in the schools by Mr. Stanley Williams. Taught one First Aid Class.

Gave 18 hours of instruction in Home Nursing and Care of the Sick to 18 women.

Took an Instructor's Short Course in Home Nursing and Care of the Sick given by a representative from National Red Cross Headquarters at Northern Michigan Children's Clinic: 5 days.

Took an In-Service Training Course at the School of Public Health at the University of Michigan, 5 days.

Meetings:

Counsel on Community Nursing	9
Adult Educational Conference	1
U. P. Health Conference	1
State Board Meetings at Lansing	2
County Public Health Nurses' Meetings	2
Regional War Nursing Counsel meeting	1
Red Cross Nurse Recruitment	3
Joint meetings of Social Agencies	2

Office Hours: 233.

Mileage: 29,500.

(Miss) Emma C. Anderson,  
County Health Nurse.

WELFARE DEPT.      ANNUAL REPORT      YEAR 1945

23.

m. RELIEF WORK

The usual program of extending assistance to certain of our families was carried on during 1945. During the year 24 families were assisted, compared with 26 families in 1944.

The following is a statement of the assistance rendered:

	<u>Ishpeming</u>	<u>Negaunee</u>	<u>Republic</u>	<u>Gwinn</u>	<u>Marquette</u>	<u>Total</u>
January	\$ 194.96	7.73	31.45	60.75	10.30	305.19
February	150.91	114.81	35.77	60.75	10.30	372.54
March	183.83	31.45	23.45	60.75	10.30	309.78
April	110.56	67.73	10.78	60.75	---	249.82
May	151.00	31.33	38.90	60.75	10.30	292.28
June	146.56	57.40	8.00	57.84	10.30	280.10
July	126.30	75.46	---	86.50	10.00	298.26
August	101.06	31.45	16.00	60.75	20.00	229.26
September	200.56	35.05	75.30	75.75	---	386.66
October	133.00	27.73	80.11	81.35	---	322.19
November	126.16	67.32	8.00	103.79	20.00	325.27
December	<u>78.80</u>	<u>89.18</u>	<u>8.00</u>	<u>81.35</u>	<u>10.00</u>	<u>267.33</u>
	\$1703.70	636.64	335.76	851.08	111.50	3638.68
Number of families assisted	11	5	2	5	1	24
Average amount of relief per family						\$151.61

n. EMPLOYMENT

The Welfare Department is regularly in contact with the Employment Office in charge of Mr. H. W. Sundberg. All special cases which involve individuals about whose employment there may be some question are discussed with the Welfare Department. This department cooperates with the Employment Department and every effort is made to protect the interests of the company, particularly with respect to applications for employment.

WELFARE DEPT.      ANNUAL REPORT      YEAR 1945

23.

o. INCAPACITATED EMPLOYEES.

During the year payments have continued to certain men and certain families who originally did not have sufficient service to bring them within the provisions of the pension system. Donations were granted to those people. Some of those men had suffered some disability through accident or through injuries at the mines, and there are some with large families who have become incapacitated.

Following is the list of families and the amount of the donation paid to them during the year 1945:

	<u>Monthly Rate</u> <u>For      1945</u>	<u>Total Amount Paid</u> <u>During      1945</u>
Sam Metherell	14.40	172.80
John Aho	14.40	172.80
Andrew Niemi	16.60	199.20
Edmund Durante	20.00	240.00
Edward Van Langenhoven	20.00	240.00
Donato Valenzio	20.00	240.00
Fred Carlson	16.00	192.00
Joseph Thomas	75.00	900.00
William Ryan	25.00	50.00 Died 2/17/1945.
R. J. Cheneour	55.00	660.00
Charles Vincent	30.00	360.00
Hilmer Lerlie	25.00	300.00
John Iskola	30.00	180.00 Died 7/ 5/1945
John Eskel Carlson	30.00	360.00
Mark Dixon	40.00	360.00 Died 9/26/1945.
Gust Oja	27.50	330.00
William Saari	25.00	300.00
Albin Romo	30.00	360.00
Simon Luoma	30.00	360.00
Michael Denofre	30.00	360.00
Matt Syrja	30.00	360.00
Nick Aho	30.00	360.00 Began 1/ 1/1945
Victor Sivula	25.00	175.00 Trans to Ret.Roll 8/1/1945.
Jacob Hautala	30.00	180.00 Began 7/ 1/1945.
Dominic Tasson	25.00	125.00 Began 7/ 1/1945
		<u>\$ 7536.80</u>

HOLMES MINE DONATIONS

Peter Lesage	20.00	240.00
Carl Jarvinen	16.99	203.88
Bernt Wiggen	20.00	240.00
Martin Trosson	20.00	240.00
		<u>\$ 923.88</u>

WELFARE DEPT.      ANNUAL REPORT      YEAR 1945.

23.  
o. INCAPACITATED EMPLOYEES. (Continued)

Donations to Widows.

	Monthly Rate For      1945	Total amount Paid During      1945
Mrs. J. H. Tregoning	25.00	\$ 300.00
Mrs. Fiina Kampinen	25.00	300.00
		\$ 600.00

FURNACE DEPARTMENT DONATIONS.

These donations, after being granted, were paid by the Furnace Department itself, and later on by the Cliffs Dow Chemical Company. By directions from Cleveland on September 1, 1937, the donations have been paid from this office and the following payments have been made during the year:

John Schrandt	25.00	300.00	
Mrs. George Cameron	20.00	200.00	Off roll 11/1/1945.
Jacob Hill	20.00	240.00	
Julius Olson	25.00	300.00	
		\$ 1040.00	

Amount of Donations paid to incapacitated employees	\$ 7536.80
Amount of Donations paid to incapacitated Holmes Mine employees	923.88
Amount of donations paid to Widows	600.00
Amount of donations paid to Furnace Department cases	1040.00
	\$ 10100.68

WELFARE DEPT.      ANNUAL REPORT      YEAR 1945.

23.

o. INCAPACITATED EMPLOYEES (Continued)

Retirement Roll.

Twenty-nine new names were added to the Retirement Roll during 1945. Each case is carefully studied with the Superintendent of the mine and is finally referred to the Manager, and if the case is approved the name is added to the Retirement Roll. It has been the Company policy to give consideration to old and faithful employees. Conferences are held with the employees from time to time and they are always encouraged to come in with their problems.

We find, in many of these cases, the social security benefits are still quite low. The Company supplements the Social Security benefits and also permits the employee to carry a portion of his group insurance. This privilege of carrying group insurance on the part of the older and retired employees means a good deal. Practically every individual who accepted retirement has also continued to carry the life insurance feature of his group insurance. This privilege is very highly appreciated.

Following is the list of men on the Retirement Roll during 1945, showing the monthly rate and the total amount paid.

	<u>Monthly Rate being paid</u>	<u>Amount Paid During 1945</u>
John Mattson	21.32	255.84
Mrs. Anna Simo	40.00	480.00
John Chiri	31.00	372.00
James Christian	39.00	468.00
Matt Hemmila	27.00	324.00
William J. Phillips	49.50	247.50 Died 6/ 6/1945.
Swen Lahti	12.31	147.72
Sam Roberts, Sr.	33.00	396.00
Sam Sims	39.00	468.00
Charles Abramson	46.50	558.00
Thomas Berryman	35.00	420.00
Charles Larson	32.00	384.00
Albin Lyman	47.50	570.00
John H. Maki	39.00	468.00
Lars Olson	36.20	434.40
Hemming Silas	35.00	420.00
Dave Spencer	32.00	384.00
Joseph Villeneuve	31.00	372.00
Henry Beale	50.00	600.00
John Hennessey	35.00	35.00 Died 1/28/45.
Erick Soyrinki	13.81	165.72
William T. Waters	20.00	240.00
Fred L. Prudom	50.00	600.00
Charles Stevens	40.00	480.00
Matt Mattson	10.00	120.00
Henry Hendrickson	10.00	50.00 Died 5/20/45.
William Kennaugh	10.00	120.00

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23.

o. INCAPACITATED EMPLOYEES (Continued)Retirement Roll (Continued)

Anton Seagren	10.00	120.00	
John Bjerne, Sr.	10.00	120.00	
John Bergeson	10.00	120.00	
Herman Johnson	10.00	120.00	
John Johnson	10.00	120.00	
Rasmus Christiansen	10.00	120.00	
August Wigg	10.00	120.00	
Otto Lindstrom	10.00	120.00	
John Chirio	10.00	120.00	
Simon Maki	10.00	120.00	
Abrem Lahtinen	10.00	120.00	
Frank Martin	10.00	120.00	
Gust Palomaki	10.00	120.00	
C. A. Steede	10.00	120.00	
John Walimas, Sr.	10.00	120.00	
Herman Aho	10.00	120.00	
Alex Boz	10.00	120.00	
John Cox	10.00	120.00	
Joseph Grevious	10.00	100.00	Died 10/16/45.
Gust Holmgren	10.00	120.00	
Chris Stone	10.00	120.00	
Otto Franson	10.00	120.00	
Michael McNamara	10.00	120.00	
Otto Schadt	10.00	120.00	
Arsene Tousignant	10.00	120.00	
Edwin Harper	10.00	120.00	
William F. Worth	10.00	120.00	
Peter Coron	10.00	120.00	
George Young	10.00	120.00	
Thomas Atwell	10.00	120.00	
Joseph Bellero, Sr.	10.00	120.00	
Swan Anderson	10.00	120.00	
Henry Hyvonen	10.00	120.00	
Henry Knudsen	10.00	120.00	
Anthony Lavelle	10.00	120.00	
Noah Morin	10.00	120.00	
Godfrey Larson	10.00	100.00	Died 10/15/45.
Antti Pasonen	10.00	120.00	
Helmer Solem	10.00	120.00	
Frank Velin	10.00	120.00	
Herman Alanko	10.00	120.00	
Thomas Graham	10.00	120.00	
Charles Rosevears	10.00	120.00	Died 2/21/45.
Thomas Welsh	10.00	120.00	
Emanuel Stephens	10.00	120.00	
Henry Heiser	10.00	120.00	
William J. Pascoe	10.00	120.00	
Fred Holm	10.00	120.00	



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23.

c. INCAPACITATED EMPLOYEES. (Continued.)

Retirement Roll (Continued.)

John Karhi	10.00	120.00		
Joseph Yopic	10.00	120.00		
Victor Lindberg	10.00	120.00		
William J. Hill	10.00	120.00		
John Freethy	25.00	300.00		
Richard C. Carlyon	10.00	120.00		
William Pearce	10.00	120.00		
Samuel Roberts	10.00	120.00		
Jonas Koskela	10.00	120.00		
A. H. Tillson	10.00	120.00		
Querino Piziali	10.00	120.00		
Charles Pascoe	10.00	120.00		
John P. Treloar	10.00	120.00		
Emil Larson	10.00	120.00		
Jacob Nikko	10.00	120.00		
William Denney	25.00	300.00		
Gust Vinge	10.00	120.00		
Thomas Hemming	10.00	120.00		
Henry Racette	10.00	120.00		
Edward Carlyon	10.00	120.00		
Antonio Filippi	10.00	120.00		
Eli Hedinemi	10.00	120.00		
Sam Stephens	10.00	120.00		
John Cleven	10.00	120.00		
John H. Kermode	10.00	120.00		
James Blee	10.00	120.00		
Edward Peterson	10.00	120.00		
Konstu Saastamoinen	10.00	120.00		
William H. White	10.00	120.00		
William T. Ninnis	10.00	120.00		
John T. Wills	10.00	120.00		
Frank Arrieri	10.00	120.00		
John Huhtala	10.00	120.00		
Carl J. Larson	10.00	120.00		
Philip T. Rowe	10.00	120.00		
Carl F. Swanson	10.00	120.00		
Mathew B. Richards	10.00	120.00		
Charles Hakkarainen	10.00	120.00		
John Baggione	10.00	40.00	Off May 1945 roll.	
Thomas D. Osier	10.00	120.00		
Marco Cazzanigi	10.00	110.00	Began 2/ 1/1945	
Zephire Nault	10.00	110.00	" " " "	
Carl F. Sundquist	10.00	110.00	" " " "	
Nick Reichel	10.00	110.00	" " " "	
Nick Kratz	10.00	90.00	" 4/ 1/ "	
Oscar Kurin	10.00	80.00	" 5/ 1/ "	
Gabriel Maki	10.00	80.00	" " " "	
John Gensheimer	10.00	80.00	" " " "	
Charles Gyles	10.00	80.00	" " " "	

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23.

o. INCAPACITATED EMPLOYEES. (Continued)

Retirement Roll. (Continued.)

William Hooper	25.00	200.00	Began 5/1/1945.
John E. Price	10.00	80.00	5/1/1945
Wm. H. Richards	25.00	200.00	5/1/1945
Frank Bridson	10.00	80.00	5/1/1945
Anthony Renaldi	10.00	60.00	7/1/ "
John Romelli	10.00	60.00	7/1/ "
Victor Sivula	10.00	20.00	8/1/ " Off Oct. roll.
Peter Bogetto, Sr.	10.00	50.00	8/1/ "
Herbert Kelly	10.00	50.00	8/1/ "
Dominic Baldini	10.00	40.00	9/1/ "
Herman J. Kojala	10.00	40.00	9/1/ "
Adelore Lafreneire	10.00	40.00	9/1/ "
Joseph A. Montcalm	10.00	40.00	9/1/ "
Peter Pascoe	10.00	40.00	9/1/ "
Richard H. Coad	10.00	40.00	9/1/ "
George S. Hill	10.00	30.00	10/1/ "
Matt Kallio	10.00	30.00	10/1/ "
John Tuuri	10.00	10.00	12/1/ "
		22240.18	

Minnesota Retirements.

In January 1945 a number of our Minnesota employees were placed on the retirement roll. Andy Nelson, a former employee of the Canisteco mine, had been retired since February 1, 1943 and was carried on the general Retirement roll, but when the Minnesota retirement roll was prepared this name was transferred to it. Two rolls are prepared, one being for the Cleveland-Cliffs Iron Company, Operating Agent for the Canisteco Mining Company, which includes only former Canisteco employees, and the other being for the Mesaba-Cliffs Mining Company, which includes former Hill-Trumbull and Holman-Cliffs employees.

The following Canisteco Mine employees were on the rolls for the year 1945:

Andy Nelson	10.00	120.00	
James H. Jones	10.00	60.00	Died 7/4/1945
John D. Murray	10.00	120.00	
John Sale	10.00	120.00	
Ole Sherman	10.00	60.00	worked 6 months.
John Wirtanen	10.00	120.00	
Isaac Mattson	10.00	120.00	
Jacob Heikkinen	10.00	110.00	Began 2/1/1945.
		830.00	

Credit June check of James H. Jones,  
deceased, (no immediate relatives)

8.55

\$ 821.45

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23.

a. INCAPACITATED EMPLOYEES      (CONTINUED)

The following men were former employees of the Mesaba-Cliffs Mining Company, at the Hill-Trumbull or the Holman+Cliffs Mines,, and were re-tired effective January 1, 1945.

Bion P. Axford	10.00	120.00	
Olaf Bjorkland	10.00	60.00	worked 6 mos.
George E. Haynes, Sr.	10.00	120.00	
Henry McGrew	10.00	120.00	
Thomas Meenahan, Sr.	10.00	120.00	
Andre Sasah	10.00	50.00	worked 7 mos.
William Saw	10.00	120.00	
Mike Skorich	10.00	50.00	worked 7 mos.
Henry J. Stephens	10.00	120.00	
Frank Marcella	10.00	120.00	
Alex Gray	10.00	120.00	
Peter Hecimovich	10.00	70.00	Began June 1, 1945
S. T. McKereher	10.00	<u>60.00</u>	Began July 1, 1945

\$ 1250.00

23.

p. COST OF LIVING

Each year we have made a brief statement regarding living costs as they came to our attention during the year. Prices are checked locally and comparisons are made, not only with other parts of the state but with other states. We use the Federal Department of Agriculture and the State Department of Social Welfare charts and index in determining what the present living rates are as compared with previous years. Using an index number of 100 as a basis of costs in 1939, we estimate that on that basis living costs have advanced approximately as follows: Food (on the basis of index number 100 of 1939), 160; shelter, 126; clothing, 135; fuel, 137; home furnishings, 150. We estimate from the few brief observations made during the past year that the cost of living during the year has, on an average basis, increased about from 4% to 6% over 1944.

Local merchants inform us that general business conditions in the district are good. They report various shortages of standard foods and clothing but some of them have reported that people will buy almost anything for any price but they seem to have established or built up a taste for better merchandise during recent years.

During the year there was no appreciable increase in the number of businesses. We have one or two new automobile agencies and garages both in Ishpeming and Negaunee and there have been one or two new food establishments opened up within the last year. We may report also that there has been no decrease in the number of taverns and that there are always a few more who wish to secure licenses to open up new taverns but, since on the basis of population we are now over the allowance for the number of taverns, no new licenses have been granted. There is every evidence that the liquor business continues to thrive.

Housing

The housing situation in both Ishpeming and Negaunee is about the same as it was a year ago. Homes and apartments are very difficult to get and during the past few years there has been very little new building. Many employees have done repair work themselves. Almost every week we have inquiries about the possibility of available homes to buy or to rent.

Relief Situation

The public relief case load in Marquette County remains at a low figure. The average for the year will be less than 100 cases per month. This low case load is due largely to the fact that so many people are employed and they have been employed quite regularly for the past several years. People who are now receiving public relief are either not employable at all or employable during the summer months only. The average age is still above 60 years, which shows that most of these people are too old for any regular type of employment.

23.

p. COST OF LIVING (Continued)

The number of aged persons in Marquette County who received Old Age Assistance from the State Social Welfare Commission in December of 1945 reached a high of 819 cases, compared with 746 for 1944. The average Old Age Assistance grant for 1945 in Marquette County amounted to \$27.22, compared with \$27.02 for 1944. The number of cases of Aid to Dependent Children, formerly known as mothers' pensions, amounted to 124 cases in December, 1945, compared with 111 at the end of 1944. The average grant in the Aid to Dependent Children category in 1945 amounted to \$53.36, compared with \$53.93 in 1944. Fourteen blind persons were given aid through the State Social Welfare Commission during 1945, compared with sixteen the previous year. The average grant amounted to \$33.90 per month, compared with \$29.15 the previous year.

It is our opinion that this mining area, in spite of the fact that new influences through organized labor have had their effect, is still one of the happiest and best mining communities in the whole country. I firmly believe that the great majority of employees of the Cleveland-Cliffs Iron Company appreciate the fact that working conditions, as well as living conditions, in this community are above the average. (We might add that since the present strike was started we have occasion to talk with some of our employees almost daily and many of them are willing and ready to return to work. This group, of course, is the unorganized group and many of them are union members.)

During the year many visits are made to various types of meetings and contact is kept with many groups, including the public schools. We see practically no evidence at all of under-nourishment and very little evidence of lack of proper clothing. In a few cases where attention seemed necessary we have made some arrangements with local schools, the nursing services, or other sources for some type of guidance to be given to families where there is lack of proper home management. In some of the schools milk is provided at a reduced price and in certain cases where children are not able to purchase the milk, it is provided by the boards of education. Some schools have provided vitamins in capsule form, free of charge. In a few isolated cases it has been necessary for our industrial nurse or the school nurse to give special attention to larger families, not so much because of under-nourishment but because of lack of proper home equipment and lack of a capacity to keep the home clean.

23.

q. IMPROVEMENT WORK

Mr. Julien Payen has charge of all the improvement work and care of all grounds and properties in the district. All of the grounds surrounding all of our properties, including the mines, the hospital, the central office building, and the shops present a very neat and tidy appearance. This program has been carried on for years and has had a very good effect upon the general morale of the community.

r. GARDENS AND WELL KEPT PREMISES

During 1945 we again conducted our Best Kept Premises and Vegetable Gardens contest. Mr. Mather established this contest many years ago and it has continued without very much interruption throughout the years. In 1945 we had over 150 entries. Judges are selected and visits to the various homes of our employees who are entered in the contest are made during August and in this work we were assisted again this year by Mr. Julien Payen, our landscape foreman, by Mr. Walter Johnson of our Compensation Department, by Mr. R. J. Veale, Chief of Police, by Miss Emily Nicholas, Secretary to the Superintendent of the Welfare Department, and by Mrs. E. E. Bjork of Gwinn. Cash prizes were distributed following the announcement of the winners.

It is our recommendation that this contest be carried on again in 1946.

s. COMMUNITY SERVICE WORK

The American Legion building in Ishpeming, formerly the old hospital, serves as the center for all Legion activities and for various other types of activities. The American Legion leases this building, maintains it, and takes care of the upkeep.

The American Legion building in Negaunee is also leased from the company and there has been considerable new activity this past year due to the fact that there are many returning servicemen joining up with the Legion. The building has been kept in good condition. Most of the repairs have been made by the company.

We have already called attention to the situation regarding the old Ishpeming Y.M.C.A. building. We now have word that Mr. Mather has donated \$30,000 for a new stadium and this should be the beginning of a new recreation center for Ishpeming, which has been planned for a number of years.

A number of the fraternal organizations in the district, such as the Knights of Columbus, Sons of St. George, Knights of Pythias, Elks, Eagles, and Moose maintain their own clubrooms. Because of the number of organizations maintaining clubrooms, the social life of the community, as far as the contributions made by the fraternal organizations, is amply provided for.

23.

t. SATURDAY NOON LUNCHEON CLUB

Our Saturday Noon Luncheon Club, made up of superintendents and heads of departments, approximately twenty-five in number, has had a few meetings during 1945. Mr. Stakel, Manager, has called these meetings when he wished to discuss some particular program or problem with the entire group.

u. OUTDOOR ACTIVITIES

During the year the usual activities in the community, from the standpoint of outdoor recreation, were carried on. The Winter Sports Area north of the city is a popular place and is used not only during the winter but also during the summer for picnics and various types of outdoor meetings. The Ishpeming Winter Sports Club has continued its program and there seemed to be an increasing interest this year in the Winter Sports Club's program.

The annual ski tournament was held on February 24th with approximately 100 entries and a larger attendance than we have had for some time. The annual ski tournament has been an outstanding attraction in this district for over fifty years. Next year the National Ski Tournament will be held in Ishpeming.

The City Council of the City of Ishpeming selected a recreation commission about six years ago and this commission has tried to work out a plan and a program for a good recreational set-up in the city. As mentioned previously, the donation by Mr. Mather is a good start and the development of the area to be known as the recreation area is now underway.

The Mather Inn

The Mather Inn has had a successful year during 1945. It is the most popular hotel in the Northern Peninsula and it is serving the public in a very fine manner. Many meetings of a community nature, local as well as larger groups outside of the community, have used the Inn for conferences, conventions and various other activities.

w. VARIOUS DEPARTMENTS AND ACTIVITIES

Each year a statement is included in the annual report covering special activities of this department throughout the year. In 1945 I completed my sixth year as a member of the State Social Welfare Commission. This commission meets once a month and establishes the policies with respect to all matters dealing with direct relief, Old Age Assistance, Aid to Dependent Children, Aid to the Blind, child welfare services, problems of adoption and licensing boarding homes, and maternity hospitals, homes for transients, and matters dealing with delinquency of juveniles.

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w.      VARIOUS DEPARTMENTS.

LAND DEPARTMENT

COMPARATIVE STATEMENT OF GENERAL WELFARE EXPENSES

FOR YEARS 1942-1945, INCLUSIVE.

<u>General Welfare Acct. No. 11.</u>	<u>1942</u>	<u>1943</u>	<u>1944</u>	<u>1945</u>
A-2 Prop. charged by Treas.	\$ 300.00	300.00	300.00	300.00
11-F Miscellaneous Expenses	<u>150.00</u>	<u>240.00</u>	<u>240.00</u>	<u>240.00</u>
	450.00	540.00	540.00	540.00
 <u>Donations:</u>				
U. P. Development Bureau	500.00	500.00	500.00	500.00
American Red Cross		550.00	825.00	905.00
Munising Fire Department				20.00
Mather High School-Munising		20.00		
Const. of Honor Roll Monument- City of Munising			13.22	
Alger County War Fund				<u>100.00</u>
	<u>500.00</u>	<u>1070.00</u>	<u>1338.22</u>	<u>1525.00</u>
 <u>Compensation:</u>				
Monthly payments to doctors	421.35	407.77	328.13	489.29
 <u>Compensation - Logging Operations.</u>				
Medical and hospital	17.02	91.50	176.56	8.00
Compensation Payments	3836.56	4800.55	3480.29	3122.12
Percentage of payroll	3.5	4.7	3.5	2.9



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w.      VARIOUS DEPARTMENTS      (Continued)

LAKE SUPERIOR & ISHPEMING RAILROAD COMPANY

COMPARATIVE STATEMENT OF GENERAL WELFARE EXPENSES

YEARS 1942-1945, INCLUSIVE

<u>Donations:</u>	<u>1942</u>	<u>1943</u>	<u>1944</u>	<u>1945</u>
Fire Department	.	5.00	15.00	35.00
American Red Cross		200.00	350.00	350.00
Munising War Fund			30.00	30.00
Marquette Honor Roll				100.00
Community Chest Fund-				
Marquette, Neg. & Ishpeming	300.00	575.00	387.50	437.50
	<u>300.00</u>	<u>780.00</u>	<u>782.50</u>	<u>952.50</u>
<u>Pensions</u>	5255.00	5700.00	5760.00	5040.00
<u>Compensation:</u>				
Compensation Paid	3590.26	2386.38	712.16	1158.18
Medical expense	931.86	1180.342	768.07	2811.58
Percentage of payroll	.0039	.0025	.0007	.0012

23.

w. VARIOUS DEPARTMENTS AND ACTIVITIES (Continued)

Other activities during the year 1945 were as follows: I have continued to serve as Chairman of the Board of Directors of Bay Cliff Health Camp, as previously mentioned in this report. I have also served another year as a director of the County Chapter of the American Red Cross, as Vice-President of the Marquette County Branch of the Michigan Tuberculosis Association; I have continued to serve as a director of the Michigan Welfare League and a director of the Michigan Society for Crippled Children and Disabled Adults, and as one of the Vice-Chairmen for the American Cancer Society.

x. POLICE DEPARTMENT

The Police Department is under the supervision of the Welfare Department and is in direct charge of R. J. Veale, Chief. Conferences are held with Mr. Veale almost daily regarding police work and plant protection. A monthly report is submitted by Mr. Veale. For the past several years we have felt that our Police Department rendered excellent service. We have tried to select new men for the department with extreme care and we have tried to discard the old policy of using older men in their declining years as members of our police force.

y. MINERS' BULLETIN

Periodically throughout the year this department, in conjunction with the Safety Department, issued the Miners' Bulletin. The Welfare Department attempts to pay special attention to the articles submitted for the bulletin in matters dealing with the health of our employees and their general welfare. It is felt that the bulletin reaches many of our employees who have no other contact with the company outside of their regular work. Special articles are prepared for each issue and we feel that the bulletin should not only be continued (following the strike) but should include more features and have a greater appeal to the employees. The Cleveland-Cliffs Iron Company has for years been known and recognized as an outstanding organization as far as its various programs for the welfare of its employees are concerned. We have not, however, made any special effort of capitalizing on many of the fine things which the company does.

23.

z. APPRECIATION

I wish to record in this report my appreciation for the cooperation, the attention and the understanding which have always been given this department by Mr. C. J. Stakel, Manager, and by Mr. C. W. Allen, Assistant Manager. I wish also to record my appreciation for the cooperation which has been received from Mr. A. J. Stromquist, Safety Director, and by Captain H. F. Rogers, his assistant. The Welfare Department strives to cooperate in every possible way with the Safety Department and we believe this cooperation has had many good results.

It should also be recorded here that the Superintendent of the Welfare Department, who also acts as Administrator of the Ishpeming Hospital, is grateful to Mr. C. W. Allen, Assistant Manager, and Mr. E. E. Riedinger, Chief Clerk, who serve as members of the Ishpeming Hospital Administrative Advisory Committee which meets monthly.

I wish to conclude my annual report by expressing my appreciation also for the splendid help and assistance of Mr. W. E. Johnson, our Compensation Agent, who has had an extremely busy year and who has served very well. We are also very happy to have Lowell C. Holmgren, who was formerly Mr. Johnson's assistant, return after three years in the military service. We are also very happy to mention the fine service rendered by Miss Emily Nicholas, my secretary, and by Miss Mary Ryan, who acts as office receptionist and file clerk. It has been necessary, particularly during the war years, to assign considerable extra work to both Miss Nicholas and Miss Ryan and I am very grateful for their fine cooperation.

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ATHENS MINE

The amplidyne control for the skip hoist has worked out very well since the changes in the master control resistors were made to equalize the steps between the segments, which avoids flashing and consequent burning. The liquid rheostat for the skip hoist M.G. set has been completely rebuilt during the year including new tile, gaskets, insulators, contact plates and a complete set of copper cooling coils.

No serious delays in hoisting operations have occurred since the skip hoist M.G. set generator risers were repaired and a new band placed over the riser connections to stop the destructive vibration which was continuously loosening the connections to the commutator.

After approximately seven years of service on the timber tunnel storage battery locomotive, the old battery was replaced with a new Exide battery in the month of October.

CAMBRIA-JACKSON MINE

Many improvements have taken place during the year, including the installation of a new 2300 volt, 3 conductor, #2/0 shaft cable which will be parallel with the old 2300 volt shaft cable which ran from the engine house to the 7th level. The installation is so arranged with subway boxes and disconnecting switches that either the new or old cable or any section between levels may be cut out in case of a fault in the system. The panels, motor and other electrical equipment purchased with the Prescott pump from the Holmes Mine have been reconditioned and made ready for installation as soon as the 7th level pump station is prepared for the installation. Repairs have also been made in the 4th level pump station including rearrangement of switches and cables and repairs to motor windings and bearings. Overhead "I" beams have been installed in this pump station for lifting the motor out of place to a convenient location for cleaning and repairing.

Changes have also been made in the ventilating system. One change was from A.C. to D.C. power on the 20 H.P. motor driven 7th level blower. When the blower was moved from near the shaft to about 1400 ft. into the 7th level the A.C. motor was replaced with a D.C. motor formerly used as a generator by the Republic Steel Company. A new Aerodyne type blower was taken from the Mather Mine and installed on the 6th level at the Cambria-Jackson and equipped with a 40 H.P. D.C. motor and automatic starter formerly stored in the Lake Mine engine house.

When the Cambria-Jackson Mine was taken over it was decided to rebuild all the Goodman locomotives at our General Shops and lower them to the 7th level. This job was completed during the year and the four Goodman locomotives are now on the 7th level.

The extension of the east end of the engine house to make room for the compressor purchased from the Holmes Mine required relocating the main 2300 volt service and the removal of several poles. The old entrance cable was replaced by 175 ft. of #4/0, 3 conductor, 350,000 C.M. cable and the main busses were extended to accommodate the switchboard installation for the compressor and relocating of the 150 K.W. haulage M.G. set.

Several costly interruptions have occurred in the hoisting operations at the Cambria-Jackson during 1945 due to failures in the 500 H.P. motor. The first difficulty arose on April 14th when a loose spacing iron between the laminations on the rotor tore the insulation from the rotor and stator coils. The 400 H.P. motor

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CAMBRIA-JACKSON MINE (Cont'd.)

recently used as a spare for the Maas cage hoist was taken to the Cambria-Jackson as a replacement while the 500 H.P. motor was sent to the Westinghouse shops for a repair job which continued until May 6th when the change to the regular equipment was completed.

Satisfactory performance was obtained until June 1st when the rotor insulation again failed and the change to the spare 400 H.P. motor was made until June 10th when the regular motor repair job was completed and the hoisting equipment restored to normal.

On July 7th a failure again occurred. The change to the spare motor was again made and the entire Westinghouse motor was shipped to the Westinghouse Milwaukee shops for another repair job which continued until August 5th. Normal operations have continued since that date and the spare motor is now stored in the Lake Mine storage house.

CLIFFS-SHAFT MINE

Some of the delays in hoisting which occurred at "A" and "B" shafts were caused by a time lag in the interlocking relays on the control panels which caused burning of contacts and arc shields. These relays have been replaced with equipment built in our shops and directly connected without coils and dashpots. The change has been completed for both hoist panels.

Some breaks in the rotor circuit of the 750 H.P. "B" shaft hoist motor occurred on July 21st which tied up the hoisting from 8 a.m. to 2 p.m. while repairs were made. A similar failure occurred again on the same rotor on October 21st requiring a repair job of 3 hours. On November 4th a more extensive repair was made when some new splices were made and replacement of conductors and clamps was made to strengthen the rotor winding and clean up some temporary repairs made during previous periods. This hoist motor difficulty will probably occur periodically on account of heavy surging and abrupt starts and stops. Any improvement in the general design of clamps and conductors would require a prolonged repair period.

Several changes have been made in the bell signal systems of "A" and "B" shafts on account of complications arising from the two systems being tied together. The job of separating these signal systems completely, with each having its 3 K.V.A., 2300/110 volt transformer, secondary fused switches and ground detectors has been finished. Each shaft station in the mine has been equipped with 3 pole fused switches for disconnecting and testing in case of faults in bell coils, pull switches, cables, etc. The cables connecting the bells and pull boxes to the switches and junction boxes have also been changed from lead covered and armored type to tirex rubber insulated cables.

Installation of the synchronous converter purchased from the Holmes Mine was completed in July. Circuit breakers and feeders were also installed for parallel operation of the converter and the existing 100 K.W. generator for mine haulage and D.C. power. The 150 H.P. synchronous motor for the 100 K.W. M.G. set has been completely rewound and the coils in the rotor repaired.

The 25 cell Gould battery recently purchased was put into service in July on one of the battery locomotives on the 11th level of "A" shaft.

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LLOYD MINE

Several interruptions occurred in the No.1 compressor operation due to flashes in the exciter armature. This armature failed in February and the spare haulage converter was used for field excitation while the armature was taken to the shops for a repair job of several days.

Loose field coils were discovered on the Westinghouse synchronous motor of the 150 K.W. haulage M.G. set while commutator repairs were being made. In order to shim and repair these coils it was necessary to remove bearings and slip rings. The entire motor was therefore sent to the shops in September. Repairs were completed and the equipment put back in operation without delay to mining or hauling while the converter carried the load with little difficulty.

Some delays in hoisting operations occurred at the Lloyd Mine due to open circuits near the connections of the stator coils of the skip hoist motor. After several of these failures, it was decided that it must be due to vibration caused by weak and loose coils. The job of repairing and tying the coils was done on off periods and completed in October.

The controls and panels from the Maas 5th level winze have been taken out of the mine and sent to the General Shops for repairs and will be used for the 7th level hoist at the Lloyd Mine.

MAAS MINE

The failure of the rotor of the 700 H.P. skip hoist motor caused a shut-down of two shifts in January. The faulty rotor was replaced with a spare bought in 1936. A new flexible coupling was bought after the recent break in the shaft of this rotor and it was put on during the shutdown. After communicating with the Westinghouse engineers regarding the rotor which failed, it was decided to ship it to their shops for a new glass tape insulated winding. The job was completed in June. The rotor was fitted with a new half flexible coupling to match the present coupling and placed on the engine room floor for a spare.

The 400 H.P. cage hoist motor was removed in February on account of a loose coupling. The spare motor was brought in from the Lake Storage house and the regular motor sent to the shops for repairs to the shaft and keyway. The job was completed and the regular motor returned during February.

Haulage and signal cables have been extended to the 6th level and the trolley, rail bonding and other electrical equipment installed as far as the level has developed. Two LM-2T6 locomotives have also been lowered to the 6th level, one from the 4th level and one from the 5th level.

The 350 H.P. slip ring motor brought from the Gwinn district and overhauled in the shops has been taken to the 3rd level at the Maas Mine for the plunger pump installation. Panels, grids and controls from the old 3rd level Alberger pump have been temporarily connected to the 400 H.P. Allis Chalmers centrifugal pump motor while its controls are being removed for installation with the equipment in the new pump house.

An auto transformer for the starting equipment of No. 1 compressor failed and burned its coils and connecting leads. This caused considerable loss of air pressure due to the shutdown of the compressor for about two shifts during July.

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MAAS MINE (Cont'd.)

A spare compensator for the starting equipment of the Holmes Mine compressor purchased for the Cambria-Jackson Mine was put into service on this job and will be used until the regular equipment is repaired.

MATHER MINE

The main 2300 volt, 350,000 C.M. power cables have been extended to the 1900 ft. level with a temporary cable connection at this point connecting the north and south cables together, forming a loop with both cables energized from the engine house. An extension of 350,000 C.M., 3 conductor cable has also been made from the subway box on shaft set No. 269 near the 1900 ft. level to a subway box on the 2050 ft. level. This connection will supply 2300 volt power for the new Ignitron converter and 2300/440 volt substations for mining operations on sublevels.

The 200 K.W. Westinghouse Ignitron was lowered to the 5th level during December. The parts are being assembled for installation and test. This unit will convert 2300 volt, 3 phase power to 250 D.C. power for trolley locomotives and other D.C. equipment if required.

NEGAUNEE MINE

The No. 2 shaft blower plant with the heating system was started on Jan. 6th after a shutdown of several weeks due to a burnout of the 125 H.P. motor. The old plant had taken care of the ventilation since the motor failure, but on account of ice in the shaft it was necessary to start the newer plant with the heating system. In order to get this plant in operation at once, the Mather Mine 100 H.P. crusher motor was taken to the Negaunee Mine and installed in this plant to keep it operating until the 125 H.P. motor was repaired. The 125 H.P. motor stator was equipped with a complete rewind and returned to the plant in May. Fenwal thermo relays were ordered and installed in both bearings of the motor as insurance against the reoccurrence of this coil and bearing difficulty.

Hoisting operations have not been seriously interrupted during the year at the Negaunee Mine. An open coil caused considerable burning at the commutator of the skip hoist motor for several days in April. The burning was intermittent however, and did not cause any delay in ore hoisting. Repairs were completed on April 29th.

The 220 H.P. synchronous motor for No. 1 haulage M.G. set was stopped on account of excessive vibration on September 21st. A test of the rotor winding revealed failures of insulation between turns in the entire set of field coils. The coils were taken to the shops for further test and repair, but they were so badly shorted that it was decided to order a complete set from Westinghouse. New coils were received about December 10th and the job of replacement commenced at once. Plenty of difficulty arose from the unbalanced condition of the rotor due to the difference in the weight of the new coils which made it necessary to balance the rotor. The job was completed December 28th. This machine was running parallel with a 250 K.W. generator when the difficulty occurred. The entire mine haulage and scraper load was carried by one generator during this period from September 21st to December 28th.

The new 3 ton Whitcomb storage battery locomotive recently purchased for the Negaunee Mine arrived on October 2nd and is now used on several levels

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NEGAUNEE MINE (Cont'd.)

for repair work and ore hauling.

Electric shovel operations were carried on without electrical difficulties after the new 1000 feet of #4, 3 conductor tirex rubber cable was taken from the Mather Mine and connected for this shovel job on March 28th.

PRINCETON MINE

The rotor insulation failed on the 200 H.P. Princeton skip hoist motor on August 13th. The motor was taken out for repairs and replaced with a motor from the shaft sinking hoist at the Mather Mine. On account of its higher speed, this motor was used with much difficulty until August 24th when it was taken out and the Maas 5th level winze hoist motor was sent to the Princeton Mine and fitted to this hoist job. The Maas motor will remain on the Princeton job until the regular motor has been rewound with a complete set of rotor coils ordered from the General Electric Company.

Some difficulties have been encountered in equalizing the haulage load of the synchronous converter and the D.C. generator. No serious delays have occurred however. Several changes in the connections have been made in an attempt to improve the operation including a voltage adjustment to 280 volts D.C. on the converter and a change in the series field excitation of the generator.

The 6 ton trolley locomotive bought from the Holmes Mine and rebuilt in our shops has been added to the Princeton Mine haulage equipment and is now on the 7th level. All locomotives in the Princeton Mine are now on the bottom level.

SPIES-VIRGIL MINE

Installation of the 250 H.P. slip ring motor and electrical equipment for the 600 gallon Aldrich plunger pump on the 6th level was completed in October. The motor and pump from the 3rd level have been repaired in the General Shops. This motor is 50 H.P. and had been running with the rotor circuit resistance in bad shape. While in the shops, the motor was repaired and equipped with bearings, internal resistors and proper brushes and hand lever for manual operation of starting device.

Two sections of the new #2/0 3 conductor, 2300 volt shaft cable have been completed in the shaft, one from the 3rd to the 6th level and one from the 6th to the 8th level. This installation also includes the necessary subway boxes and switch connections to parallel each section with the old power cable. The necessary cable is also on the job for a complete installation from the 3rd level to the engine house.

TILDEN MINE

A ballbearing failure occurred during August which tied up the 120-B shovel at the Tilden Mine. Considerable time was required to locate and procure a bearing for the job and complete the repairs. The commutator for the large generator was repaired before the shovel was put back in service.

The winding of a 20 H.P. slip ring motor was destroyed when a rock wedged between the rotor and stator of one of the churn drill motors. The stator was sent to the General Electric shops in Milwaukee while the rotor was repaired in our shops.



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TILDEN MINE (Cont'd.)

One of the old 15 H.P. churn drill motors was installed as a temporary replacement.

GENERAL

During the year the following compressors have been equipped with new thermostatic relays for automatically stopping the compressor in case of dangerously high discharge air temperature:

Athens Mine	-	Ingersoll-Rand	-	358°F
Athens Mine	-	Nordberg	-	300°F
Cambria-Jackson Mine	-	#1 compressor	-	300°F
Cliffs-Shaft Mine	-	#1, #2, #3	-	300°F
Lloyd Mine	-	#1 compressor	-	300°F
Maas Mine	-	#1 and #2	-	300°F
Mather Mine	-	#1 and #2	-	300°F
Negaunee Mine	-	Ingersoll-Rand	-	330°F
Negaunee Mine	-	Nordberg	-	300°F
Princeton Mine	-	Nordberg	-	280°F
Spies-Virgil Mine	-	Ingersoll-Rand	-	300°F

*Arthur Olson*

22. REPORT OF GEOLOGIST FOR THE YEAR ENDING DECEMBER 31, 1945A. STAFF

The staff of the Geological Department for the year 1945 is shown in Table I below:-

TABLE I.

<u>Name</u>	<u>Occupation</u>	<u>Hours Lost</u>		<u>Hours Overtime</u>	<u>Net % Hours Worked</u>
		<u>Sickness</u>	<u>Absence</u>		
E. L. Derby, Jr.	Chief Geologist	-	133 $\frac{1}{2}$	28 $\frac{1}{2}$	98.6
Burton H. Boyum	Asst. Geologist	-	86 $\frac{1}{2}$	-	95.7
Archie Minnear	Draftsman	-	82 $\frac{3}{4}$	-	95.9
E. A. Allen	Sampler	75 $\frac{1}{2}$	47 $\frac{3}{4}$	-	93.5
George M. Olson	Sampler	21 $\frac{3}{4}$	72 $\frac{1}{2}$	-	95.3
Mrs. Belle F. Bloch	Office Assistant	43 $\frac{1}{2}$	66	-	94.2

The year was divided into the factors shown in Table II, below:-

TABLE II.

Total Working Days	278 days (2001 $\frac{3}{4}$ hours)
Sundays	52 "
Full days resulting from Saturday afternoons	26 "
Holidays	9 "
Total	365 days.

Table III, below, shows the average number regularly employed, on a full time basis, on the Staff of the Geological Department during the past five years:-

TABLE III.

<u>Year</u>	<u>Average Number of Men</u>
1941	4.5
1942	4.0
1943	4.2
1944	5.6
1945	5.1

B. GENERAL CLASSIFICATION OF THE WORK OF THE DEPARTMENT

The work of the Geological Department was divided between the various mines, explorations and miscellaneous items shown in Table IV, below:-

TABLE IV.

<u>ITEMS</u>	<u>HOURS WORKED</u>	<u>PERCENT</u>
<u>MINES</u>		
Athens . . . . .	327 $\frac{3}{4}$	2.9
Book . . . . .	2	-
Cambria-Jackson . . . . .	245	2.1
Canisteeo . . . . .	84	.7
Cliffs-Shaft . . . . .	614 $\frac{1}{4}$	5.4
Hill-Trumbull . . . . .	144	1.3
Holman-Cliffs . . . . .	132 $\frac{3}{4}$	1.2
Lloyd . . . . .	252 $\frac{3}{4}$	2.2
Maas . . . . .	164 $\frac{3}{4}$	1.4
Mather . . . . .	997 $\frac{1}{4}$	8.8
Morris . . . . .	92 $\frac{1}{4}$	.8
Negaunee . . . . .	246	2.1
Pontiac . . . . .	15	.1
Princeton . . . . .	212	1.8
Republic . . . . .	38 $\frac{3}{4}$	.3
Spies-Virgil . . . . .	487 $\frac{3}{4}$	4.2
Tilden . . . . .	99 $\frac{3}{4}$	.9
Total Mines . . . . .	4,155 $\frac{1}{4}$	36.2
<u>EXPLORATIONS</u>		
Athens Mine . . . . .	145 $\frac{3}{4}$	1.3
Cambria-Jackson Mine . . . . .	289	2.5
Cliffs-Shaft Mine . . . . .	361	3.1
Lloyd Mine . . . . .	154 $\frac{3}{4}$	1.3
Maas Mine . . . . .	52 $\frac{3}{4}$	.5
Mather Mine . . . . .	187 $\frac{1}{4}$	1.6
Negaunee Mine . . . . .	61	.5
Princeton Mine . . . . .	93	.8
Spies-Virgil Mine . . . . .	310 $\frac{1}{2}$	2.7
Section 1, 47-27 . . . . .	714 $\frac{3}{4}$	6.3
Section 3, 47-27 . . . . .	411	3.6
Section 4, 47-27 . . . . .	447 $\frac{1}{4}$	4.0
Section 5, 47-27 . . . . .	200 $\frac{3}{4}$	1.7
Section 19, 45-25 (Princeton Mine Surface) . . . . .	70	.6
Section 24, 43-35 (Spies Mine Surface) . . . . .	253 $\frac{1}{2}$	2.2
Total Explorations . . . . .	3,753 $\frac{3}{4}$	32.7
<u>MISCELLANEOUS</u>		
Aerial Surveys . . . . .	9 $\frac{1}{4}$	.1
Annual Report . . . . .	114 $\frac{1}{4}$	1.0
Beneficiation of Iron Ores . . . . .	121	1.1
Depletion Estimates . . . . .	69	.6
Engineering Department . . . . .	50	.4
Geological Surveys on Company's Mineral Estate . . . . .	2,696 $\frac{3}{4}$	23.5
Investigating Mineral Land Offers . . . . .	200 $\frac{1}{4}$	1.7
Investigating Outside Explorations . . . . .	59 $\frac{3}{4}$	.5
Michigan Mineral Land Company . . . . .	1 $\frac{3}{4}$	-
Miscellaneous Geological Expense . . . . .	255 $\frac{3}{4}$	2.2
Total Miscellaneous . . . . .	3,577 $\frac{3}{4}$	31.1
GRAND TOTAL . . . . .	11,486 $\frac{1}{4}$	100.0

B-1. DESCRIPTION OF WORK BY STAFF MEMBERS

Supervision of all drilling, explorations, and geological surveys, in particular, and the activities of the Department in general, continued to be my direct charge throughout the year. This included frequent trips to the Mesaba Range on account of the drilling, metallurgical test work on samples and estimates of ore reserves at the Canisteeo, Hill-Trumbull and Holman-Cliffs Mines. Other than this, the more important activities included the following:-

In JANUARY, I attended the 18th annual meeting of the Minnesota section of the A. I. M. E. held at the University of Minnesota in Minneapolis and also, immediately following this, the 6th Annual Mining Symposium held at the same place. The latter, likewise, was a technical session. It was dedicated largely to the possible concentration of Mesaba taconites and other lean iron formations for the eventual production of a high grade product on a commercial and economical scale. Both meetings were largely attended (approximately 150) by Lake Superior District iron ore geologists and engineers. They were productive of intelligent and helpful discussions.

I made an estimate of the possible crude material that could be mined by open pit at the old Republic Mine which might be beneficiated and mixed with our Cliffs Group ore, in its concentrated form, without agglomeration. This was in connection with a metallurgical report on the subject prepared by Mr. Holt.

In FEBRUARY, Mr. Fayette Brown conferred with me on the general subject of ore reserves of the Lake Superior District and numerous current problems relating to the Company's operations during his visit to the Marquette Range. Later in the month I went over our entire current exploration program and outlined plans for the extension of this program with Mr. S. L. Mather in company with Messrs. Stakel, Allen and Holt.

In MARCH, Messrs. Pardee and Eddy, State Mine Appraiser and his Assistant, came to Ishpeming on their annual examination trip and I went over with them the estimates of the Company's ore reserves which previously we had submitted to Mr. Pardee for his appraisal calculations.

I conducted a party of Geologists and Engineers through the workings of the new Spies-East deposit. The party consisted of Dr. Carl E. Dutton of the United States Geological Survey and Messrs. F. E. Keese, G. A. Kohler, R. S. Kroger, all of The M. A. Hanna Company whose Bates Mine property adjoins the Spies on the Northeast. Mr. Boyum also accompanied me on this examination. The Hanna officials were particularly interested in the prospect of the extension of this ore body onto the Bates property and in planning a drilling program to investigate this possibility.

In APRIL, I conferred with E. J. Longyear Company officials, at their office in Minneapolis, relative to the possibility of developing a technique of rotary drilling in the so-called "jig" ore material on the Mesaba Range, to take the place of our present structural drilling. The latter has proven very satisfactory in wash ore horizons but when the ground becomes harder due to a lesser alteration of the taconite, resulting in a "jig" material, it does not give us a satisfactory sample. It pulverizes the ground and therefore destroys the structure and the means of classifying the material accurately. I determined to try the use of a large diameter Bortz bit and the recently designed ball-bearing inner-tube core barrel on this work, but such a serious shortage of drilling personnel developed that it was decided to defer this experiment until the coming spring.

While in Minneapolis, I spent some time at the Mines Experiment Station at the University of Minnesota, going over several tests being made on the magnetic concentration of taconite and similar lean iron formations.

I went to Lansing, where I joined Messrs. Geffine, Stakel and Allen in a conference with Messrs. Pardee and Eddy in our annual review of the values placed on our Michigan properties by the latter. Mr. Allen and I prepared a joint report on this conference.

In MAY, I spent two days at our Cleveland office with Messrs. Stakel and Sterling. We held conferences with Messrs. A. C. Brown and S. L. Mather and other officials on the current drilling program on the Marquette Range and plans for the immediate future drilling schedule, together with other departmental matters. Also, we went over the Canisteo and Holman properties in connection with the anticipated purchase of the stock of the Canisteo Mining Company. Following this, I spent a day in Bethlehem, Pennsylvania, conferring with Mr. W. L. Cumings, Chief Geologist of the Bethlehem Steel Company, and other Bethlehem officials, and two days in Lebanon, Pa., in company with Mr. P. L. Steffensen who is in charge of iron ore research for the Bethlehem company.

After attending meetings of the Consolidated Coppermines Corporation in New York, I joined Mr. Greene there in a conference with Messrs. Jacobs and Steffensen of the Bethlehem Steel Company in connection with interests common to both companies and especially in the field of the beneficiation of lean iron formation.

I attended the Public Tax Hearing, in Ishpeming, on May 14th, held before the members of the Michigan State Tax Commission and Messrs. Pardee and Eddy, State Mine Appraiser and his assistant. I accompanied Messrs. S. L. Mather and R. D. Fisher to the Mesaba Range and on a trip over the Range. Following this, I went to Minneapolis and conferred with Mr. Fred B. Snyder in connection with Land Offer No. 2325, in which the Cascade Corporation offers to the Company a lease on its holdings on the Cascade Range. While in Minneapolis, I conferred with Mr. Lambert and Mr. Heilig, Engineers at the School of Mines, University of Minnesota, who make the reserve estimates for the Minnesota State Tax Commission. We discussed in considerable detail the Hill-Trumbull and Bingham properties which were to be reviewed by the Commission.

In JUNE, Mr. Russell Miller of Negaunee, who represents the several fee interests in the Negaunee Mine, conferred with me on the drilling we were doing on the 14th Level of this property. This was in connection with the so-called "Amendatory Agreement" of our lease on the property.

I spent two days early in the month and another two days the last of the month in our Cleveland office conferring with Messrs. Geffine, Gordon and Probeck on problems of depletion covering all of our mining properties in preparation for a meeting with Mr. A. H. Wellensiek later in the summer. Mr. Wellensiek is Engineer for the Internal Revenue Department with offices in Cleveland and was delegated to prepare a report on the depreciation, amortization and depletion of our mining properties, on both the Michigan and Minnesota Ranges, for the years 1942 and 1943.

I also spent two days at our Cleveland office with Messrs. Stakel and Allen, conferring with Mr. Greene, S. L. Mather and Raymond, relative to the problem of forming a Company to explore and develop the Company's potential ore reserves in Section 11, 47-27. The thought is that two consuming interests would join us in such a company. On returning through Chicago, Messrs. Stakel,

Allen and I joined Messrs. Brown and S. L. Mather in a conference on the same subject and I accompanied Messrs. Brown and Mather at an interview with Mr. C. B. Randall, Vice President of the Inland Steel Company as representing one of the proposed consuming interests.

I attended a meeting of the Iron Ore Technical Committee at the Battelle Memorial Institute, Columbus, Ohio, with Mr. S. L. Mather, in connection with the investigation of concentrating the lean iron formations of the Lake Superior District being conducted by the Battelle staff. This work is being sponsored by the Company and nine other Lake Superior iron ore operators and has been underway for two years. On my return from this trip, I conferred in Chicago with Mr. H. S. Larimer, Land Commissioner of the Chicago & North Western Railway Company, relative to acquiring a supplement to our lease on the NE $\frac{1}{4}$  of NE $\frac{1}{4}$  of Section 19, 45-25, which is a part of the Princeton Mine. This will be discussed in detail below in connection with the drilling on this property.

Later in the month I was present at a meeting of the Minnesota Section of the A. I. M. E. at the College of Mines in Houghton. Papers were presented covering problems on silicosis and the geology of the territory on the Marquette Range lying to the South of Lake Michigan.

In JULY, on the occasion of the annual visit of the Directors of the Company to the Marquette Range, I addressed them on the general geological features of the Marquette Range and, in particular, as they applied to the Company's mineral lands. I also discussed the future problems of concentration to effect a merchantable product from the unenriched iron formation of the principle ranges of the Lake Superior District. I joined other local officials of the Company in showing the Directors around the Range and visiting the various operating mines of the Company.

Mr. Wellensiek, Mr. Gordon and Mr. Probeck came to the Range and we went over the depletion estimates of all of the Company's active mines and visited the various properties. We made an underground examination of the Princeton Mine. Mr. Wellensiek, as noted above, is the Cleveland representative of the Internal Revenue Department and in charge of our Federal Income Tax returns. He had had little or no former experience with our mines and came here more on an educational trip rather than otherwise. Mr. W. C. Gordon, for many years, was the Engineer in charge of our depletion estimates for the Internal Revenue Department, and has made many trips to our properties. He has retired, but is being employed as a Consultant and as a representative of the Company in our contacts with Mr. Wellensiek. We all went to the Mesaba Range, stopping enroute to examine the Book, Ravenna and Spies properties. On the Range, we went over the ore reserve and stripping estimates of the Canisteo, Hill-Trumbull and Holman-Cliffs properties and visited these mines as well. From the Range, I went to Minneapolis and again conferred with Mr. Fred B. Snyder on a proposed lease to the Company of lands on the Cascade Range now under lease to the Cascade Corporation, represented by Mr. Snyder.

I conferred with Mr. Archibald and Braund on Land Offer No. 2272, covering land owned by the D. M. & N. Land Company. Mr. Braund, is Geologist for the Inland Steel Company. This conference was in preparation for a meeting later in the month at the Inland Steel Company office in Chicago and attended by Mr. Archibald and me. At the latter meeting, the D. M. & N. Land Company, represented by Mr. William B. Cudlip and Mr. George B. McCallum, proposed that the Michigan Mineral Land Company acquire a lease or leases on D. M. & N. Land Company mineral lands, provided the latter first will explore for and discover at least 3,000,000 tons of merchantable iron ore within a single concentrated area on its property. The meeting was held with Mr. Randall, Vice President of the Inland Steel Company.

Mr. L. P. Barrett, Vice President, and Mr. H. S. Peterson, Local Manager of the Interstate Iron Company, conferred with Messrs. Stakel, Allen and me relative to the Company joining with Interstate in one or more union holes to be drilled on the latter's lands close to the South boundary of Sundry Parcel No. 1, which is owned by the Arctic Iron Company. This property is in Section 5, 47-26, South of the Athens Mine. We recommended such a program and it was carried out. It is discussed later in this report.

In AUGUST, I conferred at our Cleveland office with Messrs. Brown and Raymond in preparation for our conference the next day with International Harvester Company officials at their office in Chicago. This conference was in connection with the proposed development of Section 11, 47-27, but was of a preliminary nature. It is anticipated that the Harvester Company will join the Inland Company in cooperating with us to develop the ore possibilities in this section.

The summer conference of the Iron Ore Technical Committee, connected with the research work being undertaken at the Battelle Memorial Institute on Mesaba taconites, was held in Hibbing. I joined Mr. S. L. Mather in attendance at these meetings. I prepared a special report covering the scope of this conference. Mr. Mather and I called on Mr. Harvie Garver in Duluth in connection with negotiations being carried on for the purchase of the stock in the Canistota Mining Company. Before returning home, I met Messrs. Lambert and Heilig at their office in the University of Minnesota, Minneapolis, and discussed with them the estimates of reserves in the Hill-Trumbull and Bingham properties which they were preparing for the State Tax Commission to be used for ad valorem tax assessments on these properties. Their work was only partially completed but had come to a point where a question of factors used in our estimate submitted to them, was under scrutiny.

Mr. A. E. Walker, Geologist for the Hanna Company conferred with me relative to the structural geology connecting the Spies and Bates properties which is indicated by the current developments and explorations at these mines. Later in the month I went over exploration data of both the Hanna Company and the Pittsburg Coke & Iron Company at their offices in Iron River in connection with the possible effect they might have in the geologic studies we are making of the Spies property.

In SEPTEMBER, I again went to the office of Messrs. Lambert and Heilig in Minneapolis. At that time I went over with them, in detail, the final figures of their new reserve estimates of the Hill-Trumbull and Bingham properties. Differences of opinion arose and I went to Hibbing where I prepared a memorandum outlining these differences and making recommendations to them for possible changes in their figures before they were submitted to the Tax Commission. Most of these recommended changes were accepted and made by them. I called on Messrs. Guy Diehl and J. F. Wolff of the Oliver Iron Mining Company at their office in Duluth and went over with them our interpretation of the structure and outline of the Pontiac ore body. This was in connection with negotiations being carried on with the Oliver Company that we hoped might culminate in our opening and mining the Pontiac manganiferous reserves.

Dr. Donald M. Fraser, Chief Geologist, and Mr. W. S. Cumings, both of the Bethlehem Steel Company, spent two days on the Marquette Range. I joined Messrs. Haller and Boyum in conducting them on an underground inspection trip through the more interesting and important current development openings in the Mather Mine. During their stay, Mr. Boyum and I went over with them, in detail, the geological cross-sections and maps of both the Negaunee and Mather Mines.

Mr. Archibald and I went over a large amount of data, including all the explorations conducted to date, on the D. M. & N. Land Company property in 43-32, Iron County. This was preliminary to a later study which we made of this data in connection with the offer of this property to the Michigan Mineral Land Company.

In OCTOBER, I joined Mr. Sterling in St. Paul where we went over data in the office of the State Tax Commission relative to the reassessment of the Hill-Trumbull and Bingham Mine leases. This was in preparation for the annual tax hearing before the Tax Commission in November.

Mr. Verne D. Johnston of Cleveland, Chief Engineer of Oglebay, Norton & Company, spent two days with me reviewing his knowledge of the Marquette Range and going over with me, in a general way, the data his company is preparing in anticipation of the future opening and mining the property of the Reserve Mining Company on the East end of the Mesaba Range in which the Company has a 10% interest. Dr. L. M. Scofield, Geologist for Pickands, Mather & Company, consulted me on detailed geological structures in the Athens Mine while he was here with other representatives of Pickands, Mather & Company. They were going over the problems at the Athens in the preparation of a report to their company.

I made a joint report with Mr. Archibald for the D. M. & N. Land Company on their mineral lands which had been offered to the Michigan Mineral Land Co.

In NOVEMBER, I joined Messrs. Donovan and Sterling in attendance at the public ad valorem tax hearing before the State Tax Commissioner in St. Paul. We filed minor protests on the reserve figures supplied the Commissioner by Messrs. Lambert and Heilig covering the Hill-Trumbull and Bingham leases. Dr. L. M. Scofield, Geologist with Pickands, Mather & Company conferred with me on general geological phases of the Lake Superior District, and, in particular, the Marquette Range, together with their applications to the geology of the Athens ore body.

I spent one day at our Cleveland office consulting with Mr. S. L. Mather on the various phases of our current exploration programs, both surface and underground. We also recorded our ideas as to exploration plans for the immediate future which will guide us in our drilling and exploring schedules. Following a meeting of the Board of Directors of Consolidated Coppermines Corporation, of which I am a member, in New York, I conferred with Mr. P. L. Steffensen, Raw Materials Engineer of the Bethlehem Steel Company in Lebanon, Pennsylvania, and in Bethlehem with Messrs. Merryweather, Fraser, Cumings, Adair and Lake, of the Engineering and Geological Departments of the Bethlehem Company. Such contacts, on returning from my periodic New York meetings during the past two or three years, have developed into a more or less important routine.

In returning through Chicago, I had a long conference with Mr. George A. Smainis, who represents fee interests in the Teal Lake Iron Mining Company, from whom we lease the Cambria-Lillie-Hartford properties. He has not visited the properties since September, 1944 and I gave him a verbal resume' of our activities since then, emphasizing the exploring we have done and our plans for the immediate future.

In DECEMBER, I spent part of a day at the Mines Experiment Station, University of Minnesota, Minneapolis, going over with Mr. E. W. Davis, Director, and his Assistant, Mr. H. H. Wade, recent developments in their concentrating work on taconite and lean iron formation and reviewing, in general, the work done in this field since my last conference with them.



BURTON H. BOYUM. Mr. Boyum continued as Assistant Geologist throughout the year. He spent 62% of his time on the geological surveys, maps and cross-sections of our operating mines; 24% on the current drilling explorations, both surface and underground; and 14% on miscellaneous duties included in the routine work of the Department. The geological surveys at the Mather Mine accounted for the largest single item of time spent on the mines. This was followed, in importance, and time consumed, by the Cliffs-Shaft, Spies-Virgil and Athens Mine in this order, with the remaining mines accounting for the balance in lesser individual amounts. The time spent on current explorations included classifying the drill cores and making daily and weekly reports of the drilling.

He made one inspection trip through the Morris Mine, visiting the recent current developments and particularly the new ore body on the 8th and 9th Levels. This ore, as it rises to the East, is approaching the Lloyd Mine boundary. The development in this direction will be watched closely for the possibility that it may extend over onto the Lloyd property. This subject is discussed in more detail under the Lloyd Mine. He also visited the current underground developments and mine workings in the Greenwood Mine of the Inland Steel Company and prepared a special memorandum on the subject.

Mr. Boyum conferred, in Crystal Falls, with Dr. Pettijohn, and went over the results to date of the latter's geological surveys being made in that District. Dr. Pettijohn is doing this work under the auspices of the United States Geological Survey for the benefit of the District and it is our intention to be conversant with this work as it progresses as well as with the final results. The Michigan Mineral Land Company, in which the Company has a half interest, owns a large mineral acreage in the area being covered. Mr. Boyum was called on several times during the year to act as host in showing distinguished guests from the various parts of the world over the Marquette Range and particularly the Company's properties. Special emphasis was placed on the geological structures controlling the ore bodies of the Range.

ARCHIE MINNEAR. Mr. Minnear continued as a Draftsman and Office Assistant with the Department during the year. He spent 76% of his time in drafting work associated with the geological surveys and maps of our operating mines; 23% on drilling explorations and 1% on miscellaneous duties included in the routine work of the Department. An important part of the time credited to explorations was spent on the monthly calculations in averaging the analyses of the various runs of ore in the current drilling.

E. A. ALLEN. Mr. Allen spent about 45% of his time during the year labeling and filing drill core and sludge samples of the current drilling and in making tests for the dip and bearing in some of the drill holes with the Maas Compass. About 42% of his time was spent in making thin sections and polished sections of drill cores and rock samples for our petrographic study and re-filing old drill core and hand specimens. This required moving the material from the core room to refiling space provided in the old Cliffs-Shaft engine house. He spent 10% of his time in connection with the geological surveys of the operating mines and 1% on miscellaneous items included in the routine work of the Department. The balance of his time, amounting to approximately 2%, was charged to the Engineering Department for his weekly observations and recordings of the water levels in the various deep well holes scattered over the surface at the Maas, Negaunee and Athens Mines. These wells were drilled for the purpose of observing and plating the fluctuation and drainage of surface water to eliminate troublesome water conditions in mining the ore bodies within these areas.

GEORGE M. OLSON. Mr. Olson spent 86% of his time assisting Mr. Allen in the core room and at the drills. This work consisted chiefly in labeling and filing drill core and sludge samples from the current drilling and making Maas Compass tests at the holes as drilling progressed. The remainder of his time, or 14%, was spent in assisting Mr. Allen in making thin sections and polished sections for microscopic study, helping to refile old core and rock specimens, and certain routine work of the Department.

MRS. BELLE F. BLOCH. Mrs. Bloch continued as an Office Assistant with the Department throughout the year. About 42% of her time was spent in recording the daily progress of current drilling and the analyses of drill samples in our permanent record books; typing the daily and weekly reports of drilling classification and in drill bit accounting. The latter consists of recording the performance and calculating the cost of the large number of mechanically set Bortz bits now being used in our current drilling. This type of bit is being improved progressively and gradually is replacing the hand-set carbon bits. Approximately 56% of her time was spent in coloring whiteprint maps and geological cross-sections in connection with the geology of our Michigan operating mines and the current explorations. This includes coloring with paint or crayon the relatively large number of prints of explorations and mine maps that accompany various reports prepared in the Department throughout the year. The balance of her time, or 2%, was spent on numerous routine duties of the Department.

#### C. SURFACE GEOLOGICAL SURVEYS

No important or extensive surface geological surveys were made during the year. Mr. Boyum made a sketch map of the outcrops in portions of Sections 26 and 36, 48--29, Clowry District, in connection with Land Offer No. 2347. I joined him in a study of the geological structure in the field, as indicated by these outcrops, and a report was made of the results of this work.

The outcrops of hard ore jasper in the Republic Mine area were examined carefully for structure. A large number of samples were taken to provide material for metallurgical tests to be made at the Mines Experiment Station, University of Minnesota, at Minneapolis. The metallurgical work will be done under the direction of Mr. Holt. He is making this study to investigate the possibility of concentrating this iron formation at sizes that will permit it to be mixed, in small proportions, with Cliffs Group ore. If this is successful, the area will provide an important source of high grade fine material which can be mined very cheaply by open pit methods. The metallurgical tests will be made during the present winter and spring.

We continued to cooperate closely with a party of Geologists from the United States Geological Survey, Washington, D. C., who are making a detailed study of the entire Iron River-Crystal Falls District, both surface and underground. The party continued to be under the leadership of Dr. Carl E. Dutton. The purpose of the survey is to correlate and consolidate the geological data of each individual mine operator, check his conclusions, fill in, as far as possible, all gaps from their own studies and publish the results in both report and map form for the common benefit of all interested parties. The field work started in 1943. The work being done in the Crystal Falls District was under the direct supervision of Dr. F. J. Pettijohn. This work is of particular interest to us as it ties in with mineral property of the Michigan Mineral Land Company, in which the Company has a one-half interest.

#### D. MINE GEOLOGICAL SURVEYS AND OPERATIONS

Underground geological surveys of the current mine extensions and development work were made during the year in all of our operating mines. The main level developments, and the newly opened and more important areas in the mine workings of the soft ore mines, were surveyed and mapped by Mr. Boyum. At the Mather Mine, which is still in the early development stages, Mr. Boyum mapped all of the geological details in the stopes as well as the development drifts and cross-cuts. This is particularly important in order to record accurately the structures controlling the ore bodies in a new area and where surface drilling was comparatively limited. Geological data in the balance of the soft ore workings was obtained by the engineers at the several properties and turned over to the Geological Department for mapping. All geological data collected was posted on the geological maps and cross-sections of each property.

At the Cliffs-Shaft Mine, due to our limited personnel, geological surveys were made only in specific areas where they were necessary for immediate planning of drilling or development work. When Mr. Madsen was hired in the fall of 1943, it was planned that he do both the engineering and geological work at this property which would have taken all of his time. The shortage of personnel in the Engineering Department made it necessary that most of his time be employed in engineering work. This has meant, except for the specific areas referred to, that the geological surveys in the Cliffs-Shaft Mine have had to be neglected for the most part. This is a hard ore property and the workings stand open indefinitely. Nevertheless, it is important that the work be caught up as soon as geological personnel can be acquired.

The Athens, Lloyd, Maas, Negaunee, Princeton and Spies-Virgil Mines operated two 8 hour shifts, five days per week to January 21st. Effective January 22nd, these mines operated two 8 hour shifts five days per week and one 8 hour shift on Saturdays. On February 5th, all of these mines changed to a schedule of two 8 hour shifts, six days per week, on which they remained the balance of the year. The Cliffs-Shaft <sup>and Mather</sup> Mines continued to operate two 8 hour shifts, six days per week, and the Cambria-Jackson Mine two 8 hour shifts, five days per week, and one 8 hour shift on Saturdays.

The Tilden Mine open pit operated 5-2/3 single shifts per week from April 23rd to June 1st. From June 1st to November 1st, the operation was six single shifts per week.

#### E. OPTIONS AND LEASES

An option to explore for iron ore, for a period of two years, on the  $W\frac{1}{2}$  of the  $NE\frac{1}{4}$  and the  $SE\frac{1}{4}$  of  $NE\frac{1}{4}$ , all in Section 19, 45-25, was granted to us on August 13th by the Chicago & North Western Railway Company. This property adjoins, on the West and South, the so-called Section 19 lease ( $NE\frac{1}{4}$  of  $NE\frac{1}{4}$  of Section 19) now a part of the Princeton Mine.

On November 27th, The Cleveland-Cliffs Iron Company purchased two-thirds, and the Mesaba-Cliffs Mining Company one-third, of the capital stock of the Canisteo Mining Company. The assets of the Canisteo Mining Company includes, among other properties, the underlying leases on the Canisteo and Holman-Brown Mines.

F. EXPLORATIONS AND COSTS

Drilling explorations were carried on in 1945 in the following Districts and Mines:

F-1 - FROM SURFACE

<u>DISTRICT</u>	<u>RANGE</u>	<u>PROPERTY</u>
Coleraine	Mesaba	Canisteo Mine
Marble	"	Hill-Trumbull Mine
Taconite	"	Holman-Cliffs Mine
Gwinn	Swanzy	Princeton Mine
Negaunee	Marquette	Section 1 Exploration
Ishpeming	"	Section 3 Exploration
Ishpeming	"	Section 4 Exploration
North Lake	"	Section 5 Exploration
Iron River	Menominee	Spies Mine

F-2 - FROM UNDERGROUND

<u>DISTRICT</u>	<u>RANGE</u>	<u>MINE</u>
Negaunee	Marquette	Athens
Negaunee	"	Cambria-Jackson
Ishpeming	"	Cliffs-Shart
North Lake	"	Lloyd
Negaunee	"	Maas
Ishpeming	"	Mather
Negaunee	"	Negaunee
Gwinn	Swanzy	Princeton
Iron River	Menominee	Spies-Virgil

Table V, which follows, gives the footage drilled, the ore encountered and the cost per foot of drilling for both surface and underground explorations. It will be noted that the average cost of surface drilling was \$6.08 per foot, excluding certain overhead items which customarily are charged to the explorations. By including these items, the average cost of surface drilling was \$6.88 per foot. The cost of underground drilling, in the same way, was \$4.76 per foot and \$5.05 per foot, respectively.

By comparison with 1944, the cost of all drilling in 1945 was higher. The increase in surface drilling was only 14¢ per foot, but the increase in underground drilling was \$1.20 per foot. Drilling in general continued to suffer from a lowered efficiency due largely to the necessity of employing a number of inexperienced men. In addition, of course, the cost of those supplies not controlled by ceiling prices was considerably higher.

In the case of underground drilling, we were not only confronted with the factors cited above, but with two projects that were very much out of line with ordinary drilling experience. At the Mather Mine, of the 2,346' drilled, 1,562' were drilled with an "R" bit, which cuts a hole 4-1/8" in diameter as compared with a BX bit commonly used, cutting a hole 2-9/16" in diameter. Some of the drilling is at a still smaller diameter. Holes drilled with the "R" bit were used to unwater the old Cleveland-Hematite Mine workings and the cost was necessarily considerably higher than holes of normal sizes.

At the Princeton Mine, which had the highest cost of all our underground drills, we ran into very difficult drilling conditions. The formation was decomposed and we were constantly impeded by caving ground. It was essential to do this drilling, however, even at what seemed to be an excessively high cost.

The Mather and Princeton drilling is responsible for the increase of underground drilling cost over 1944 above that already cited.



F-3. - DIAMOND DRILL CARBON AND BORTZ

The following tabulation shows the amount and inventory value of the diamond drill carbon and Bortz on hand at the beginning of the year, the amount used during the year, and the balance on hand at the end of the year. For the first time in several years, no new carbon nor Bortz was purchased.

	CARBON			BORTZ		
	Carats	Amount	Per Ct.	Carats	Amount	Per Ct.
On Hand Jan. 1, 1945 - -	971.70	\$79,630.94	\$81.95	95.23	\$ 617.48	\$ 6.48
Used during 1945 - - -	38.55	3,159.18	81.95	7.00	45.39	6.48
On Hand Dec. 31, 1945 -	933.15	\$76,471.76	\$81.95	88.23	\$ 572.09	\$ 6.48

In using the above carbon and Bortz, it is set into bits by hand by our own organization. We are using an increasingly large number of mechanically set Bortz bits which we purchase ready for use. After each bit has ceased to cut, or to function economically, it is returned to the manufacturer for a salvage credit. The good Bortz remaining is cut out and reset.

F-4. - DRILL SECTIONS

Cross-Section tracings of all drilling, showing the analyses and classification of the material encountered during the year on the Marquette and Menominee Ranges will be found recorded, in colors, in the Annual Report books that are submitted as a part of the Annual Report of the Engineering and Geological Departments. The holes drilled at our Mesaba Range properties are shown on cross-sections, also in color, in these Annual Report books.

G. DESCRIPTION OF EXPLORATIONS

THE CLEVELAND-CLIFFS IRON COMPANY

G-1. - EXPLORATIONS IN SECTION 3, 47-27, MICHIGAN

The drilling in Section 3, during 1945, continued to be confined to two forties which are leased from the Oliver Iron Mining Company, - namely, the SE $\frac{1}{4}$  of NE $\frac{1}{4}$  and the SW $\frac{1}{4}$  of NW $\frac{1}{4}$ . The lease on these descriptions expires on July 1st, 1974.

In the SE $\frac{1}{4}$  of NE $\frac{1}{4}$ , Hole No. 41 was drilling in the lower horizon of iron formation at a depth of 1,801' at the beginning of the year. This hole was drilled vertically on the 15920 W. meridian approximately 400' South of Hole No. 38. The purpose of the hole was to explore for an extension down the dip of the 29' of ore encountered in Hole 38, lying on the Siamo slate footwall. Forty-five feet of high grade ore was cut from 2160' to 2205', which averaged 63.45% Iron, .106% Phos., and .024% Sulphur. This ore was some distance above the footwall, however, and undoubtedly is controlled by a geologic structure other than that allocating the ore in Hole No. 38. Fifteen feet of ore was cut from 2465' to 2480', which averaged 57.55% Iron, .293% Phos. and .012% Sulphur. This ore, although only half as thick as that encountered in Hole 38, and of somewhat lower grade, also lies on the main footwall slate and may have a connection with the ore in it. The hole was bottomed in footwall slate at a depth of 2576' on May 4th.

Hole No. 44 is also located in the SE $\frac{1}{4}$  of NE $\frac{1}{4}$ . It is being drilled vertically at a point approximately 250' South and 460' West of Hole No. 41. It is on approximately the 16380 W. meridian and only about 30' North of the South line of the property. The purpose of this hole is to follow up a possible Westerly

extension of the ore encountered in Hole No. 41. Drilling commenced on May 28th and the hole was drilling in the lower horizon of the iron formation at a depth of 2097' at the end of the year. This point is still probably some 500' or 600' above the footwall contact and above the two horizons of ore encountered in Hole No. 41. Due to lack of personnel, we have had to cut drilling to a single shift several times during the progress of the hole. Also, advance has been slowed considerably at times by vuggy and broken ground which has had to be cemented and finally cased off.

Holes Nos. 42 and 43 were drilled in the SW $\frac{1}{4}$  of NW $\frac{1}{4}$ . Hole No. 42 was completed in 1944 and discussed in full in the Annual Report for that year. Both holes were drilled by the E. J. Longyear Company of Minneapolis, Minnesota, under contract. Hole No. 42 was drilled vertically in the Northwest part of the property on the 1600 South coordinate and encountered no high grade ore, but it succeeded in locating a Westerly extension of an East-West fault that forms a crotch structure. For this reason, Hole No. 43 was drilled from the same location but with a dip of -74° due North. Drilling was started on December 8th, 1944 and the standpipe had reached a depth of 121' still in surface material, at the beginning of the year 1945. Soft ore jasper iron formation, some of it quite rich, was encountered all the way to the footwall slate, but without enrichment to high grade ore. The slate contact was cut at 1001' and the hole bottomed in it at 1055' on March 3rd.

The area remaining unexplored on this property after the completion of Hole No. 43 was of such limited extent that further drilling seemed unwarranted. Accordingly, the drill was moved to the central part of Section 4 to the West, where a new drilling program was laid out.

#### G-2. - EXPLORATIONS IN SECTION 4, 47-27, MICHIGAN

The only drilling done previously in Section 4 was of a relatively shallow nature and confined principally to locating the strike of the footwall across the section and determine its depth. Several relatively short holes drilled to the South of the footwall, in the North central part of the section, were blank. All of this drilling was done previous to 1920.

The trace of the slate footwall contact with the iron formation at ledge, from East to West, across the Northern half of the section reveals no faulted displacement of any magnitude. On the other hand, a study of the relative thicknesses of several segments of the intrusive sill, which crosses the section just South of the East-West center line, indicates a possible structural disturbance. Also, it has been demonstrated quite clearly from the drilling on the North half of Section 3 to the East that the large greenstone outcrop crossing the boundary line between the two sections, and most of which lies just South of the East-West center line, is bounded on the Northwest by a Northeast-Southwest trending fault of considerable magnitude. Both of these structural features may have influenced mineralizing agencies and formed a concentration of ore at, or near, the slate footwall at a considerable depth.

In order to test the area to a moderate depth and get a more accurate idea of the structural conditions before drilling to relatively greater depth, the first hole in this campaign, No. 30, was drilled vertically on the 23600 W. meridian and is approximately 350' South and 50' West of the center of the Section. Also, it is on the same meridian with four shallow holes some distance to the North which help to cross-section the area. Drilling in Hole 30 commenced on March 20th. It is North of the contact of the jasper iron formation with the main intrusive greenstone member and, therefore, did not encounter this intrusive



material. Drilling was all in soft ore jasper to a depth of 2001'. From 2001' to 2085' the jasper was enriched with seams of lean, second class and good ore. The high grade material was only 12' in thickness from 2023' to 2035'. This 12' averaged 61.16% Iron, .451% Phos., and .011% Sulphur. It is my candid opinion that the relatively high phosphorus content is purely a local condition. The main Siamo slate footwall was cut at 2104' and the hole bottomed in it at a depth of 2164' on August 2nd.

Although the ore in Hole 30 is not of commercial thickness, it is exceedingly gratifying that the first hole in this virgin area should encounter such enrichment and indications of rather intensive mineralizing activities. It encourages us to believe our theory of structural relationship to ore concentration in this locality is correct.

Hole No. 31 is being drilled vertically on the same meridian and approximately 550' South of Hole 30. The purpose is to explore either for the downward continuation and possible thickening of the ore in Hole No. 30 or a possible structural trough on the down side of the Northeast-Southwest fault mentioned above. Drilling commenced on August 18th. The hole not only cut the intrusive greenstone series of sheets but found it at elevations indicating that this block has been displaced several hundred or more feet downward by faulting with respect to the block of ground cut in Hole 30. This is exactly what we anticipated. The greenstone material, interrupted by an occasional lens of soft ore jasper, extended from 575' to 1623'. Drilling below this was all in typical soft ore jasper, with an occasional thin seam of dike material. The hole had reached a depth of 2659' at the end of the year.

Realizing that this drilling is in a most interesting and promising area and with the faulting of relatively great magnitude indicated by Holes 30 and 31, it was decided to start a second drill without waiting for the completion of Hole No. 31. Any large body of ore in this general location is bound to be deep and require considerable time to reach it. Hole No. 32 is being drilled vertically with our own equipment. It is located on the same meridian (23600 W) and 500' South of Hole 31. Drilling commenced on December 27th and the standpipe had reached a depth of 41', still in surface material, at the end of the year.

### G-3. - EXPLORATIONS IN SECTION 5, 47-27, MICHIGAN

Holes Nos. 29, 30 and 31, which were drilled in 1943 in the NW $\frac{1}{4}$  of SE $\frac{1}{4}$  of Section 5, discovered a fault striking Northwest and Southeast, and dipping steeply to the Northeast. The intersection of this fracture with the slate footwall displaced the latter to form a crotch favorable for the concentration of an ore body. Holes Nos. 32 and 33 were drilled at some depth into this crotch in 1944. Hole 33 had reached a depth of 1615' on the first of the year and was drilling in typical soft ore jasper iron formation. It encountered footwall slate at 1925' and was bottomed in it at 1970' on March 16th.

Neither this hole, No. 33, nor No. 32 encountered any high grade ore in this crotch. Because of the favorable geological features, however, it was considered advisable to drill at least one more hole in this area. Accordingly, Hole No. 34 was drilled vertically on the 9800 E. meridian approximately 225' South of the East-West center line of the Section. Its location is about 750' East of Hole No. 32 and 300' South of old Hole No. 2. It is in the NE $\frac{1}{4}$  of the SE $\frac{1}{4}$  of the Section. Drilling commenced on June 21st. The hole encountered typical soft ore jasper iron formation with occasional encouragingly rich seams, but no commercial ore. It cut the <sup>3/4</sup>footwall contact at 1404' and was bottomed in it at 1485' on November 19th.

I do not believe we have exhausted the possibilities of discovering a relatively large body of high grade ore in this area. Nevertheless, the drilling to date has been a disappointment. It was considered more important to discontinue this drilling on the completion of Hole 34 and use the crew at location No. 32 in Section 4 described above. If ore could be discovered in Section 4, it might extend toward Section 5 and eventually lead us to the same general area in the latter which otherwise we might have drilled upon the completion of Hole 34.

G-4. - PRINCETON MINE SURFACE, SECTION 19, 45-25, MICHIGAN

The ore bodies forming the Princeton Mine occur in folds of cherty iron formation on top of a relatively flat lying arkose footwall. This formation is folded into a syncline pitching at a low angle to the Northwest. Folds in the Northeast limb contain the granular type ore in the mine and the Southeast end of the syncline the plastic ore. The Southwest limb of this syncline has never been completely outlined or explored. We did not know how far the iron formation extended to the Northwest along this limb or whether there were additional folds of iron formation that might contain ore bodies. It was decided, therefore, to drill several vertical holes from surface to outline the trend of the arkose-iron formation contact in hopes that we might find additional ore bodies. The NE $\frac{1}{4}$  of the NE $\frac{1}{4}$  of Section 19 is leased from the Chicago & North Western Railway Company and contains the explored portions of the Princeton syncline. In order to expand drilling in case the Southwest limb should be found to have an important extension and be ore bearing, we acquired permission, in the form of a drilling option, to incorporate the other three forties of the NE $\frac{1}{4}$  of the Section in this drilling program. The option provided for incorporating these forties in the original lease if ore was discovered.

The first hole to be drilled in this program was No. 51. It was drilled vertically from a point 300' due South of old Hole No. 42, about on the 865' W. Meridian. This places the hole almost on the South line of the NE $\frac{1}{4}$  of NE $\frac{1}{4}$ . The hole commenced on September 14th and after drilling through 451' of hanging material, it encountered jasper iron formation. This extended only 37' to 488' and contained no enrichment. At this point, footwall arkose was cut and the hole was bottomed in it at 530' on October 17th.

Hole No. 52 was drilled vertically from a point approximately 475' West of No. 51 and 300' South of old Hole No. 48. This placed it practically in the center of the NE $\frac{1}{4}$  of the section. Drilling commenced on October 26th. After drilling through 413' of hanging material, another 37' of jasper iron formation was cut to a depth of 450'. As in Hole No. 51, this iron formation contained no enrichment. Footwall arkose followed at 450' and the hole was bottomed in unaltered granite at 467' on December 10th. On account of the lean and unfavorable appearance of the jasper iron formation in these two holes, it was decided to abandon further tracing of this limb of the Princeton Mine syncline.

G-5. - SPIES MINE SURFACE, SECTION 24, 43-35, MICHIGAN

Hole No. 71 was drilled with a dip of -60° due South in the Southeast part of the NE $\frac{1}{4}$  of SE $\frac{1}{4}$  of Section 24. It was the Southernmost hole of a series of six located on the 4900 E. meridian. The trend of the slates and included iron formation on the North side of this cross-section in the vicinity of Holes 65, 66 and 67 is roughly North & South. At the location of Holes 68 and 70, drilled from the same set-up, and 400' North of No. 71, the formations are folded to

roughly an East-West strike. Hole 71 was located to cross-cut the South limb of an apparent syncline and explore for a productive iron formation on this limb. This hole was started on November 15th, 1944 and was drilling in cherty gray slate and iron carbonate at a depth of 365' at the beginning of 1945. A completely oxidized and rich looking jasper iron formation was cut at 893' and extended to 1040'. There was no high grade concentration, but it is the type of formation that makes ore in the Iron River District provided favorable structural conditions are developed within it. This hole was bottomed in gray slate at a depth of 1216' on March 5th.

The next hole drilled on this description was No. 77. It is located 900' due West of No. 71 on the 4000 E. meridian and has a dip of  $-60^\circ$  due South. The purpose of this hole was to follow up the Westerly extension of the promising-looking iron formation encountered in Hole 71, hoping to find a structure within it favorable for the concentration of a commercial ore body. The standpipe in this hole was started with a dip of  $-60^\circ$ , but after three attempts to get it down to ledge through the relatively thick boulder-bearing surface material, it was steepened to  $-65^\circ$ . At the end of the year, however, the third attempt on the  $-60^\circ$  angle had just been abandoned at a depth of 216' and inclination tests showed that the pipe had flattened to a dip of  $-30^\circ$ . The steeper pipe, at  $-65^\circ$  was started soon after the first of January, as Hole No. 78. Although ledge has not been reached at this writing, progress has been steady. The surface material in this area frequently gives a great deal of trouble before standpipes reach the ledge on account of the large number of boulders.

The second drill rig employed at the Spies Exploration was drilling in Hole No. 72 at the beginning of the year. This hole, which was drilled vertically, is located in the  $NW\frac{1}{4}$  of the  $NW\frac{1}{4}$ , about 450' South and 125' East of the Northwest corner of the section. It is the first of a series of three holes which were drilled in the  $N\frac{1}{2}$  of the  $NW\frac{1}{4}$  of the Section for the purpose of trying to pick up an Easterly extension of high grade ore encountered in the James Mine, lying immediately West in Section 23. The latter ore was encountered in James Mine underground hole No. 24, drilled vertically from the first sub above the 6th Level. It encountered 60' of high grade ore at a depth of 860' below the surface and only 250' West of the Spies west boundary line. Hole No. 72 was drilling in hangingwall banded gray slate at a depth of 434' on the first of the year. Drilling was stopped temporarily at a depth of 555' on January 4th in order to use the drill crew to resume underground drilling in the Virgil Mine. Additional personnel could not be secured and it was thought the underground drilling should be completed as soon as possible because of the relatively short life in the Virgil property. All of the drilling on the Spies-Virgil property is being done under contract by E. J. Longyear Company of Minneapolis, Minnesota.

Drilling was resumed in Hole 72 on March 14th and continued in hanging wall slates with some interbedded cherty iron carbonate belonging to an upper horizon of unoxidized iron formation which, even when thoroughly oxidized, does not produce important ore bodies in the Iron River District. Tests with the Maas Compass showed that the hole wandered considerably from its initial vertical dip. By the time it had reached a depth of 1827', and still in gray slates, probably hanging wall, its plotting showed the hole to be crossing the North boundary of the property at a dip of  $-52^\circ$ . Therefore, the hole was stopped at this depth on May 31st.

Holes Nos. 73 and 74 were vertical standpipes sunk to ledge in the vicinity of the new Spies-East ore deposit. They were located just West of the East boundary line of Section 24, on approximately the 5200 E. meridian and 300' apart, North and South. They were put down to observe the effect on the ground

water level by the underground pumping. No. 73 reached ledge at 110' and was bottomed in it at 113'. It showed static water at a depth of 81'. No. 74 encountered ledge at 143' and was bottomed in it at 144'. It showed the static water level at 84'. The collar of Hole 73 was 6' higher than No. 74, thus showing a relative drop in ground water level, in going South 300' from Hole 73 to Hole 74, of 9'.

Since Hole No. 72 was not successful in picking up the Eastward extension of the James Mine ore, or the cherty iron formation in which it is contained, it was decided to drill the next hole, No. 75, from a location approximately 1500' East of No. 72 and with a dip of  $-70^{\circ}$  due North. It was located on the 1600 E. meridian. Drilling commenced on June 9th and nothing but hangingwall gray slate mixed with an increasing amount of cherty iron carbonate was encountered by the time the hole had reached the North boundary of the property at a depth of 893'. It was stopped at this point on July 26th. Tests showed that the hole had flattened to a dip of  $-58\frac{1}{2}^{\circ}$  at the bottom.

One more attempt was made to encounter the productive iron formation of the James Mine by drilling Hole No. 76 about half way between Holes 72 and 75. It was drilled with a dip of  $-65^{\circ}$  North on the 800' E. meridian. Drilling started on August 2nd and the ground encountered, as in the other two holes, continued to be gray slate with a considerable amount of cherty iron carbonate mixed in, until the North boundary of the property was reached at a depth of 865'. The hole was stopped at this point on August 25th. Tests show the hole had flattened to a dip of  $-51^{\circ}$  near the bottom. The exploration was discontinued on the completion of this hole.

If the James Mine productive horizon does extend Easterly onto Section 24, our drilling to date indicates that it must pitch rather steeply to the East for a greater part of the distance across the  $N\frac{1}{2}$  of the  $NW\frac{1}{4}$ . Our principal interest in this drilling was to encounter this formation at or above the present working levels in the Virgil Mine to facilitate its development from these levels. Possibly, at some time in the future, we will be warranted in planning deeper drilling in this area in another attempt to pick up a horizon of productive iron formation.

#### G-6. - CAMBRIA-JACKSON MINE

One drill was kept in the Cambria-Jackson Mine working almost continuously during the year. Ten holes, Nos. 162 to 171, inclusive, were completed.

Hole No. 162, which was drilled horizontally and due South from the main 7th Level drift on the 9600 W. meridian, had cut two runs of high grade ore and was drilling in soft ore jasper at a depth of 210' on the first of the year. This ore was a new discovery and not an extension of known ore. The hole was bottomed at 310' in soft ore jasper, after having encountered 10' of high grade ore from 220' to 230', averaging 57.30% Iron, .028% Phos., and .061% Sulphur, and a considerable footage of enriched formation running from 47% to 55% Iron.

Hole No. 163 was drilled horizontally and S.  $18^{\circ}$  E. from near the West end of the 7th Level. Its course is parallel to the strike of the steeply dipping fault dike at the West end of the level which has been an important factor in localizing ore bodies all through the upper part of the mine. The hole is about 120' East of this dike and the object was to explore the area adjacent to the dike for a downward extension of the ore above as well as for a Westerly extension of the main ore body to the East. High grade ore was cut from 147' to 153', averaging

58.70% Iron, .061% Phos., and .023% Sulphur, and again from 168' to 183' averaging 62.87% Iron, .091% Phos., and .010% Sulphur. The hole was drilled to a final depth of 459'.

A series of six holes, Nos. 164 to 167, inclusive, No. 170 and No. 171, were drilled from the 5th main level. All known ore was exhausted and mining discontinued on this level several years ago by the former operator, the Republic Steel Corporation. All of these holes were drilled from near the South end of the cross-cut extending South on the 87 W. meridian and on the old Hartford property. The purpose of these holes is to explore the ground Southeast of the old mine workings at this elevation in an attempt to discover and develop additional ore on the Hartford.

Hole No. 164 was drilled horizontally and due South to a depth of 567'. Although it encountered some enrichment in the jasper iron formation, no high grade ore, in commercial quantities, was cut. It did, however, find a diabase dike (from 108' to 133') which, by later drilling, proved to be an important influence in the formation of at least two merchantable ore bodies to the Northeast on this same elevation. Hole No. 165 was drilled horizontally and S. 43° W. until it cut this dike from 300' to 334' and was bottomed at 368' in blue jasper on the hanging side of the dike. From the location of the dike in these two holes, its strike appears to be a little North of East and South of West.

Hole No. 166 was drilled horizontally and S. 70° E. It cut high grade ore from 75' to 165', averaging 62.90% Iron, .171% Phos., and .012% Sulphur, and again from 235' to 296', averaging 59.42% Iron, .113% Phos. and .012% Sulphur. It also cut the ore-influencing dike at 317' and was bottomed in it at 321'. These two ore runs marked the discovery of the two commercial ore bodies mentioned above. Hole No. 167 was drilled horizontally and S. 52° E., making an angle of approximately 18° with Hole 166. It cut high grade ore from 75' to 110' averaging 65.17% Iron, .053% Phos. and .010% Sulphur. The ore-influencing dike was encountered from 235' to 265' and the hole was bottomed in soft ore jasper on the hanging side of the dike at 295'. The ore in this hole undoubtedly connects with the first run of ore in Hole 166. Because the second ore body was not cut, it is assumed that the ore passes below the hole in its assumed pitch to the West from its position in Hole No. 166.

Hole No. 170 was drilled with a dip of -25° and S. 50° E. This places it almost directly below Hole No. 167. The purpose was to explore for the extension of the ore in the latter hole down the dip and try to pick up the second ore body, encountered in Hole 166, on its pitch. High grade ore was cut from 41 to 121', averaging 61.17% Iron, .109% Phos. and .011% Sulphur. It encountered the ore-influencing dike from 216' to 247' and was bottomed in rich soft ore jasper at a depth of 265'. At the point it should have cut the second ore body, the ground was rich but averaged only about 48% Iron. It is still possible, however, that the ore passes above or below the hole.

Hole No. 171 was drilled horizontally on a course of N. 49° W. to explore for the downward continuation of a persistent ore body mined down to an elevation 25' above the 5th Level but not encountered in a cross-cut below it at the elevation of the level. It was drilled to a depth of 99' and stopped at the end of the year. For 81', it passed through rich soft ore jasper and then into footwall transition slate and jasper. No high grade concentration was encountered. Additional drilling will be planned in a further attempt to find the downward continuation of this ore.

The two remaining holes, Nos. 168 and 169, were drilled horizontally from the same location at the West end of the 6th Level. The purpose of these holes was to explore South and West of the Northwesterly-Southeasterly fault dike that forms the West limit of the Hartford-Cambria-Jackson ore bodies. The drilling done to date in this block of ground has been only to shallow depths and without encountering ore. Hole No. 168 was drilled due South to a depth of 714' and encountered no material enrichment. It did, however, locate the limit of displacement of the slate footwall on the West side of the fault giving us structural information which is valuable in our study of this area and the location of future holes. Hole No. 169 was drilled S. 34° W. When it had reached a depth of only 86' on November 24th and was still in footwall slate, the hole was discontinued in order that the drill and crew might be used to drill holes 170 and 171, discussed above. The information obtained from the latter two holes was much more important than that anticipated in Hole 169.

#### G-7. - CLIFFS-SHAFT MINE

Drilling was continuous in the Cliffs-Shaft Mine throughout the year and most of the time two drill rigs were employed. Eleven holes were completed, an old hole re-entered and extended, and two holes partially completed, for a total of 4,826'. The holes completed were Nos. 551 to 560, inclusive, and Hole No. 562. Hole No. 477 was re-entered and extended, and holes 561 and 563 were being drilled as the year closed. This drilling developed a total of 335' of high grade ore (above 57% Iron); 96' of second class ore (from 50% to 57% Iron) and 91' of lean ore (from 45% to 50% Iron). A considerable proportion of the second class ore, where it is adjacent to high grade ore, will be mined and mixed with the latter for shipment.

In discussing this drilling, the holes will be considered by levels instead of in their chronological order.

On the 1st Level, "B" Shaft, three holes, Nos. 557, 559 and 560, were completed during the year and one hole, No. 561, was drilling at the end of the year. All of these holes were drilled horizontally, or nearly so, from the Section 9 workings for the purpose of outlining the possible ore limits to aid in developing this isolated area. Hole 557 was drilled practically due North through the iron formation and into the slate hanging wall. It cut three runs of high grade ore of mineable width, aggregating 27'. No. 559 drilled toward the hanging on a course of N. 46° W. but before reaching the contact, the hole caved and in attempting to clean it out, a chopping bit was lost in the hole. After spending a week attempting to recover the bit without success, the hole was abandoned. Hole No. 560 was drilled between Holes 557 and 559 on a course of N. 26° W. through the iron formation and into the hanging. This hole encountered three runs of high grade ore of mineable width, aggregating 40'. Hole No. 561 is being drilled on a course of S. 36° E. to explore the footwall side of the formation. After cutting 2' of 65% ore at the start of the hole, it drilled through footwall dike material to a depth of 198'. At this point, hanging wall quartzite was encountered in faulted contact with the footwall. It was still drilling in this hanging material at the end of the year at a depth of 441'. The hole will be continued until it encounters a normal contact with hard ore jasper, which is the locus of the ore bodies in the Cliffs-Shaft Mine, or until there is evidence that we are crossing the nose of an anticline with the hanging material dipping to the South. The latter seems possible.

On the 2nd Level, "A" Shaft, Hole No. 553 was drilled horizontally and S. 6° E. from the South side of the level and East part of the Section 10 Lease.

This is one of a series of holes, part of which have been completed and others planned, at various elevations, to determine the outline and trend of the main ore body on this lease. The hole was blank and encountered only hanging material.

On the 3rd Level, "A" Shaft, Hole No. 555 was drilled horizontally and due South, also on the East side of the Section 10 lease, and below Hole 553 on the 1st Level, to get underneath the hanging wall. It encountered two runs of high grade ore, aggregating 64' before hitting the hanging in which it was bottomed.

"A" Shaft,

On the 5th Level, Hole No. 551 was drilled horizontally and due South from the South side of the level and on Section 10 lease. It had encountered the main ore body extending from 63' to 165' and was drilling in hanging wall slate at a depth of 312' at the beginning of the year. It drilled through slate and into footwall dike faulted up against the slate and finally into soft ore jasper where it was bottomed.

On the 6th Level, "A" Shaft, three holes, Nos. 552, 556 and 562, were completed and Hole No. 563 was being drilled at the end of the year. Hole 552, which was drilled horizontally and due South on the Section 10 lease, was drilling in hard ore jasper at a depth of 246' on the first of the year. It encountered two runs of second class ore averaging from 54% to 57% Iron and aggregating 11', but no high grade ore, and was bottomed in footwall dike. Hole 556 was drilled horizontally and due South on the 2400 E. meridian, on the Section 10 lease, approximately 200' East and three levels below No. 555 to continue outlining the limits of the Section 10 Lease ore body. It encountered four runs of high grade ore aggregating 53' and passed into hanging wall slate where it was bottomed. Hole 562 was drilled horizontally and S. 4° E. on approximately the 980' E. meridian, starting practically at the North boundary of the Section 10 lease. Its location is approximately 360' West of Hole 552. The hole crossed a complex fault zone and got into hanging material on the South side, cut a small amount of hard ore iron formation and then crossed another fault into soft ore jasper. This latter fault contact limits the hard ore formation on this meridian at the 6th Level elevation. No high grade ore was encountered. Hole No. 563 was drilled from the same location as No. 562 but with a dip of -29° S. 5° E. The purpose here was to get under hanging material in the fault complex encountered in the latter hole. It encountered 7' of high grade ore from 81 to 88' and was drilling in hanging wall conglomerate at a depth of 121' at the end of the year.

On the 10th Level, "A" Shaft, Hole No. 558 was drilled horizontally and due South along the 2200 E. meridian from the breast of a cross-cut on the Section 10 Lease. This location is approximately 450' West of the East boundary of the lease which forms the West boundary of the old Moro Mine. The object of the hole was to explore the hard ore horizon lying adjacent to the slate hanging wall at this elevation. Any ore found in this horizon would have a faulted relationship with the main Section 10 lease ore body. The hole crossed the South boundary of the Section 10 Lease onto Oliver Iron Mining Company property at a depth of 437' and was carried to an ultimate depth of 600' without encountering the objective hanging contact. Also, no enrichment was encountered in the hole. Apparently the normal contact of the hanging wall is still further South on Oliver property due either to a flattening of the dip or displacement upward by faulting.

On the 10th Level, "B" Shaft, Hole No. 477 was reopened and deepened and No. 554 was drilled. Hole 477 was a horizontal hole drilled due North from near the West end of the level in the Section 9 deposit. The object was to explore for the Easterly continuation of the high grade ore encountered in Hole 472,

located 200' to the West. No such extension was found in No. 477 when it was stopped in November, 1940 at a depth of 255'. Since that time, ore has been developed at the 9th Level elevation in this vicinity. It was thought this ore might extend down to the 10th Level elevation. Consequently, the hole was re-opened and was deepened to a depth of 383'. The new ground drilled was soft ore jasper cut by two dikes and no enrichment. This soft ore formation represents footwall material under the hard ore series. Hole No. 554 was drilled horizontally and due South on the 2520 W. meridian in order to reach and explore the West side of the old Barnum property. It formerly was leased to the Oliver Iron Mining Company, but now is a part of the Cliffs-Shaft Mine. The first 2' was high grade ore. This was followed by footwall dike and the hole remained in it for its entire distance until the hole was finally bottomed at a depth of 898'. We had hoped to find an East-West fault with a downward displacement on the South side sufficient to bring the productive part of the hard ore formation down to this elevation. Apparently, if a displacement occurs, it has no such magnitude.

#### G-8. - LLOYD MINE

Two holes, Nos. 169 and 170, which were drilling at the beginning of the year, were completed and five additional holes, Nos. 171 to 175, inclusive, were drilled in the Lloyd Mine during the year. All of them were located on or started from the 8th Level.

Hole No. 169, which was drilled horizontally and S. 35° W. in the area to the West of the main ore body, was drilling in soft ore jasper at a depth of 529' on the first of the year. The purpose of this hole was to explore for a faulted off-set in the slate footwall forming a crotch favorable for the concentration of high grade ore. It had cut the East end of such a crotch in December, 1944, with high grade ore from 279' to 292'. It found no high grade ore lying on the hanging side of the faulted position of the slate, however, and was bottomed in jasper at 607' on January 10th.

Hole No. 170, which was drilled horizontally and due South on the 2110 E. meridian and from the South end of the Southeast cross-cut in the center of the main ore body, was drilling in soft ore jasper at a depth of 10' on the first of the year. The purpose of the hole was to explore for ore at the elevation of the level which had been found South of a diabase dike in Hole 167 drilled with a dip of -50° almost directly below it. High grade ore was encountered from 140' to 160', averaging 60.00% Iron, .207% Phos., and .019% Sulphur. This ore is close to the faulted block of footwall slate lying to the South. This slate was cut at 168' and the hole bottomed in it at 196' on January 23rd.

A series of four holes, Nos. 171, 172, 173 and 175, was drilled due South from the footwall side of the level across the main ore zone in order to complete outlining the ore limits both on the level and below it. Holes 171 and 172 were drilled horizontally, hole 173 was drilled with a dip of -38° and Hole No. 175 with a dip of -67°. The holes were successful in encountering the ore and outlining its limits. Sufficient tonnage has been developed by drilling below the 8th Level to warrant the sinking of a winze from which to develop and mine it.

Hole No. 174 was drilled horizontally and S. 19° W. from a cut-out in the footwall drift on the 700 E. meridian. The purpose of the hole was to explore two possible crotch structures made by the intersection of Northerly dipping fault dikes with the Southerly dipping Siamo footwall slate. The East end of the Southernmost crotch was cut in Hole 169 described above. Hole 174 was



drilled to an ultimate depth of 1054'. It passed to the East of the first crotch and did not find commercial ore in the second.

With the completion of Hole No. 175 on September 22nd, referred to above, all drilling in the Lloyd Mine was discontinued for the balance of the year. It is unlikely that additional drilling will be done until the development below the 8th Level from the new winze is well underway.

#### G-9. - MAAS MINE

Early in January it was decided to resume a short drilling campaign to assist in laying out certain development work in ore. Hole No. 60 was drilled with a dip of  $-3^{\circ}$  S.  $31^{\circ}41'$  W. from the +75' Sub-Level at a location of S. 660 and 1874 W. The purpose of the hole was to explore for the downward continuation of the ore on the +100' Sub-Level and outline it on the +75' Sub itself. We knew this ore extended to the 5th Level elevation and is much larger there than had been developed on the +75' Sub. Although ore was encountered, it showed a decided contraction in size on the Sub-level and the hole was bottomed in jasper at a depth of 165'.

Hole No. 61 was drilled horizontally and S.  $79^{\circ}$  W. at S. 763 and 1795 W. on the 5th Level. This location is at the North end of the North-South cross-cut on the 1800 W. meridian. Mr. Moulton, Superintendent, located the hole in order to cross Hole 50 which was drilled due South on the 1970 W. meridian, also to sample the ore area indicated by the latter hole. It was thought, however, that this area should have been drilled with due South holes located in the East-West footwall drift. In that way, the formation would have been crossed whereas in the present hole, drilling was pretty much parallel with the strike of the ore-bearing formation. The ore body was encountered and was found to be extremely high in Sulphur, but this had been anticipated. The analysis of the principal ore run from 126' to 215' was 60.64% Iron, 1060% Phos., and .719% Sulphur. As mentioned above, it followed pretty nearly the strike of the formation. It was completed at a depth of 270' on April 3rd. This terminated drilling in the Maas Mine for the balance of the year.

#### G-10. - PRINCETON MINE

Hole No. 12 was drilled vertically from the bottom of No. 3 Shaft. It was planned to drift on the 7th Level to the position of this hole and put up a raise to connect with the bottom of the shaft and equip it for hoisting. The purpose of the hole was to assist in ventilation during the raising operation. It was started in footwall arkose on December 30th, 1944 and bottomed in the same material at a depth of 32' on January 16th, 1945. The drill machine broke down at this point, but the hole had reached to within a few feet of its objective and therefore was not continued. It was a simple matter to blast into the bottom of the hole when the drift reached its general location.

Hole No. 13 was drilled with a dip of  $+7^{\circ}$  and S.  $66^{\circ}$  W. from the North side of the second cross-cut on the 7th Level at a location of S. 1368 and 558 E. The purpose of the hole was to explore the iron formation adjacent to a dike which cuts the ore body to the East and, also, to seek a possible Westerly extension of the South limb of the ore body itself. This ore is contained in a flat syncline pitching slightly to the Northwest. Almost nothing was known of the footwall contact with the ore zone along this limb. Considerable difficulty was encountered in this drilling because of the softness and flat-lying character of the jasper iron formation. Caving occurred almost continuously and casing was

difficult. Finally, however, the jasper-arkose contact was cut at a depth of 706' and the hole bottomed in arkose at 750' on October 6th. No high grade ore was encountered and further drilling was discontinued.

G-11. - SPIES-VIRGIL MINE

Two holes, Nos. 129 and 130, were drilled from the 8th Level of the Virgil Mine, starting on January 6th and being completed on February 17th. Both of them were drilled horizontally and within 15' of each other in the North drift about 635' East of the West property line. This places the holes approximately 435' East of Holes 127 and 128. It will be recalled that both the latter holes encountered merchantable ore in what is believed to be the North limb of a synclinal fold, the South limb of which contains the main Virgil ore body and in which the North drift is located. The ore in the drift, as well as in both the latter holes, was high in sulphur but if the syncline rises to the East and ore cuts the elevation of the level on the North limb, it might be followed upward to a point where the sulphur would drop to a normal content. Such has been our experience in mining the Virgil ore body. Holes 129 and 130 were drilled for the purpose of locating an upward extension of ore on the North limb of the syncline and the work was done under contract by the E. J. Longyear Company of Minneapolis, Minnesota.

Hole No. 129 was drilled on a course of N. 34° E. to a depth of 598' and No. 130 on a course of due North to a depth of 625'. Neither hole was able to locate the ore or iron formation and no further drilling was done in the Virgil during the balance of the year.

Upon the completion of the drilling in the Virgil Mine, the drill was moved to the Spies-East deposit where six holes, Nos. 14 to 19, inclusive, were drilled. Hole No. 14 was drilled horizontally and N. 71° W. from the +1050' Sub-Level, 25' above the North end of the North drift on the 4th Level. The purpose of the hole was to determine whether the slate encountered on the West side of the 4th Level drift was part of the main hanging wall formation or a seam of slate interbedded with the ore itself. The hole was drilled to a depth of 161' without encountering high grade ore. This proved conclusively that the slate does ~~not~~ represent the West limit of the ore body.

Holes Nos. 15 and 16 were drilled horizontally from the extreme East end of the main 4th Level. No. 15 was drilled on a course of S. 36° E. to cross-cut the slate horizon on the Johnson Lease to explore for possible interbedded ore horizons, but especially to cross-cut the iron formation containing seams of ore which was encountered in surface hole No. 7. The latter followed along nearly parallel with the strike of the formation and because it was in and out of ore several times, we thought it might have followed close to the contact of an ore body. Hole No. 15 cut across the strike at a satisfactory angle. When the hole had reached a depth of 650' on March 28th, it was stopped temporarily because of a flow of ground water from the hole, amounting to 25 or 30 gallons per minute. The pumping capacity of the mine was limited by the breakdown of the pump on the 3rd Level and it was thought wise not to continue this hole until the pump had been repaired. Drilling was resumed on May 8th but had to be stopped again on the 17th at a depth of 756' on account of a relatively large increase in ground water. Drilling was started a third time on October 15th but was discontinued again on October 27th for the same reason and until sufficient pumping capacity can be provided. The hole had reached a depth of 870' and was in rich jasper iron formation. This formation had been encountered at 650' and in places contained seams of lean and second class ore. The ground will be allowed to drain before finally completing the hole.

Hole No. 16 was drilled due East, also to cross-cut the slate horizons on the Johnson Lease and with the possibility of encountering interbedded horizons of cherty iron formation in which high grade ore may be found. Favorable iron formation was encountered between 1077' and 1224' which represents a horizon heretofore unknown. Rich jasper iron formation again was cut from 1363' to 1382', also not known before. Although the collar of the hole is approximately 200' South of the boundary line between the Johnson Lease on the South and the Bates Mine on the North, Maas Compass tests showed it to deviate to the North to such an extent that it passed onto Bates property at approximately 1077'. It was finally bottomed at a depth of 1394'. Although no enrichment was found in either band of iron formation encountered, if a favorable structure can be discovered, very likely ore will be contained within it. The information was given to the Hanna Company, who leases the Bates Mine, in our policy of exchanging information with them in this District. We have received valuable information from the Hanna Company in return which aids us materially in our drilling within this area.

No. 17 was a short hole drilled horizontally and N. 46° W. from the +1125' Sub-Level, with a Company-operated Gopher one-man drill machine. Its location was S. 2436 and 5234 E. and its purpose was to aid in outlining the shape and size of the new ore body. Considerable difficulty is being experienced in developing this ore due to the large amount of water seeping through the ground. This has slowed development considerably and has made it impossible for the men to work in some of the localities until the ground has been drained. By using this drill in the place of small development drifts, the outline of the ore body can be defined with considerable less difficulty and discomfort. Hole No. 17 is the first of a series of such holes which will be drilled as time goes on. It was drilled to a depth of 87' and accomplished its purpose.

Hole No. 19 was similar to No. 17 and was drilled from the same sub-level horizontally on a course of N. 84° W. from a location of S. 2533 and 5153 E. It was drilled to a depth of 65' and encountered 25' of high grade ore..

Hole No. 18, using the Longyear machine, was drilled horizontally and S. 70° E. from the same location on the East end of the 4th Level as No. 16. The purpose of the hole was to determine whether the jasper iron formation, encountered in Hole 16 after it passed onto Bates Mine property, continues Southerly on the Johnson Lease and possibly into a folded structure that might contain high grade ore. It was drilled to an ultimate depth of 1575' and completed on October 11th. It encountered rich, well-oxidized jasper iron formation from 1305' to 1513' but, unfortunately, no high grade ore. This horizon may be followed to the South and West at a later date still hoping that a structure favorable for the concentration of ore may be found as well as a body of ore itself. Drilling was discontinued for the balance of the year on the completion of this hole.

#### THE NEGAUNEE MINE COMPANY

#### G-12. - SECTION 1, 47-27 EXPLORATION

Drilling from the surface on the N $\frac{1}{2}$  of Section 1 was continuous throughout the year with two drill rigs being employed. Two holes, Nos. 139 and 140, which were started the latter part of 1944, were completed. Hole No. 141 was completely drilled and Nos. 142 and 143 were partially drilled. The total footage of this exploration during the year was 7,804'. All holes were drilled vertically and 338' of high grade ore was developed.

Hole No. 139 was located on the 7800 W. meridian, which is approximately 150' West of the North-South center line of the Section. Its position is about 470' South of Hole 137 and 730' North of Hole 136. The purpose was to define the geologic structure between these holes and, if possible, to determine the relationship of the ore in each of them. No. 139 was drilling in typical soft ore jasper at a depth of 1268' on the first of the year. It encountered two runs of high grade ore and was finally bottomed in footwall Siamo slate at a depth of 2479' on April 21st. The ore was as follows:

<u>From</u>	<u>To</u>	<u>Amount</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sulphur</u>
2002	2049	47'	60.75	.071	.019
2210	2275	65'	57.67	.082	.016

Hole No. 140 was located on the 10200 W. meridian, approximately 130' East of the West boundary of the section and 1250' South of the Northwest corner. It was the first of several holes planned to be drilled on this meridian to explore the West side of the Section for favorable geologic structures and possible high grade ore bodies. Such ore may be either extensions of known occurrences some distance to the East and West, or entirely independent ore bodies. There is a major fault striking Northwest and Southeast that passes to the East and relatively close to this hole, which may have influenced mineralizing solutions, resulting in the concentration of ore not far above the footwall slate. This fault, we believe, is an extension of the main fracture which has played an important part in the allocation of the Cambria ore bodies. The hole was drilling in typical soft ore jasper at a depth of 1112' on the first of the year and was bottomed in footwall Siamo slate at 2375' on April 30th. Several seams of enrichment were encountered between 1961' and 2238', ranging in iron content from 45% to 54%. Although no high grade ore was encountered, the geological data obtained is of important value to us in getting a clear idea of the structure along this meridian.

Hole No. 141 was located on the 7200 W. meridian approximately 550' South of the North line of the Section. The purpose of the hole was to continue the study of a feasible location for a deep shaft through which to mine the large bodies of ore indicated on this section by the drilling to date. Drilling commenced on June 21st and the hole was bottomed in Siamo footwall slate at a depth of 1775' on October 4th. High grade ore was encountered from 1571' to 1593'. The top 11', from 1571' to 1582', averaged 61.47% Iron, .090% Phos., and .504% Sulphur. The lower 11' averaged 59.89% Iron, .245% Phos. and .020% Sulphur. This run of ore, while not of commercial importance in itself, may be the upper and thinning extension of ore in merchantable quantity to the South. The high sulphur content of the upper 11' very likely is a local condition at this particular horizon.

After the completion of Hole No. 140, the drill was moved to No. 142 on the same meridian, and approximately 1000' due South of the former hole. It is being drilled to continue our studies of the geologic structures on this meridian and in search for high grade ore on the West side of the Northwest-Southeast fault mentioned in discussing Hole No. 140 above. Drilling commenced on May 15th and the hole had reached a depth of 2770' on the last of the year. It was drilling in high grade ore at that time. Several runs of good ore were encountered in this hole as follows:

<u>From</u>	<u>To</u>	<u>Amount</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sulphur</u>
2232	2243	11'	64.00	.022	.013
2252	2261	9'	58.62	.014	.010
2517	2530	13'	61.67	.175	.016
2559	2660	101'	61.44	.091	.010
2670	2730	60'	57.34	.119	.020
2758	2770	12'	60.49	.204	.019

Undoubtedly the above ore extends westward onto Mather Mine property in Section 2, and may have an important connection or relationship with the deep ore in surface holes 27A and 40 on the Mather.

Hole No. 143 is located on the 7200 W. meridian, 400' due North of Hole No. 141 and approximately 150' South of the North line of the section. The purpose of this hole is to find out whether the ore encountered in hole No. 141 extends up the dip and, if so, whether it has a mineable thickness. Both holes 141 and 143 are in the area being considered as a location for a deep shaft, surface equipment and stockpile grounds to serve the deep ore on Section 1. Hole No. 143 is the sixth hole to be drilled within the area. Drilling commenced on October 26th and the hole was drilling in typical soft ore jasper at a depth of 785' on the last of the year. No high grade ore had been encountered.

#### G-13. - MATHER MINE SURFACE, SECTION 2, 47-27

No drilling was done on Section 2 during the year.

A considerable flow of water was encountered in mining operations in the Mather Mine in the vicinity of surface hole No. 49. As is customary, we plugged this hole with cement just below ledge at its completion. Apparently, however, porous ground along the course of the hole is water-bearing and the hole, below the plug, acted as a pipe in transmitting this water to lower elevations where finally it found its way into the mine workings. As an experiment, the hole was reopened in October and a cement plug placed at a depth of 1525', just above the ore horizon. Following this, the entire hole was filled to ledge surface with cement. The work was completed on November 14th and, almost immediately, the water disappeared from the underground workings.

With the success experienced in Hole 49, it was decided to repeat the process in surface hole No. 51. Considerable difficulty was encountered in re-entering the hole because the surface material over it had caved and the cement plug, placed in the hole just below ledge at its completion, had spread out and concealed the actual collar. Finally, however, this plug was drilled out and the hole completely filled with cement in the manner employed in Hole 49. This work was completed on January 12th, 1946.

#### G-14. - MATHER MINE

Eleven holes were completed and one partially drilled in the Mather Mine during the year for a total of 2370' and encountered 171' of high grade standard ore.

Six holes, Nos. 13, 14, 15, 17, 18 and 19, were drilled horizontally from the 960' Level for the purpose of draining the old workings of the Cleveland Hematite Mine. The water from these workings presented a potential hazard to the drainage problem in the Mather as they are within 600 to 1,000 feet North and only

a short distance East of the Mather shaft. Already, some of the workings in the Mather had become very wet and it was believed due to seepage of water from the bottom of these workings. Before this drilling could be done, drifting on the 960' elevation was carried as close to the bottom of the old workings as safety would permit and pilot holes were kept ahead of the breast at all times. Discrepancies in the surveys of the old workings resulted in some of these holes not reaching their objectives although considerable water was removed through them. Finally, holes 17 and 19 penetrated the bottom of the workings and effected the drainage, resulting in immediately improved water conditions in the Mather stopes nearby. This was all negative drilling, of course, as far as ore was concerned. A total of 1564' was drilled, all in iron formation.

Hole 16 and holes 20 to 23, inclusive, were drilled from the 5th Level. Hole 16 was drilled horizontally and S. 19° E. from the South end of the first cross-cut. The purpose of the hole was to locate the South limit of the ore in which the cross-cut was breasted as well as to explore for possible geologic structures farther South that may be favorable to additional ore concentration at this elevation. The hole started in ore and its South limit was encountered at 35'. This ore averaged 61.25% Iron, .101% Phos. and .019% Sulphur. Twenty-two feet of second class ore, averaging 52% Iron, was encountered from 105' to 127'. The hole was bottomed in jasper iron formation at 199' without encountering additional high grade ore. This second class enrichment, however, may indicate high grade ore down the dip.

Holes 20 to 23, inclusive, were drilled from the several cross-cuts to aid in planning the development work on the 5th Level. Nos. 20 and 21 were drilled horizontally and due South from the second and third cross-cuts respectively, hole 22 was drilled with a dip of +42½° S. 15° E. from the back of the first cross-cut and hole 23 was drilled with a dip of +44° S. 5° E. from the second cross-cut and was completed on December 26th at a depth of 172'. All of these holes were relatively short.

Toward the end of December, a second drill machine was moved into the mine to drill hole No. 24. It is being drilled horizontally and S. 34° E. from the extreme end of No. 7 cross-cut on the 2nd Level. The purpose of the hole is to define the width and general position of the ore at this elevation which was cut in surface hole No. 39 and underground hole No. 10. The latter was drilled horizontally into this area from the 3rd Level and stopped in ore which was high in Sulphur at that elevation. Hole No. 24 was drilling in enriched soft ore jasper at a depth of 79' on the last of the year.

#### G-15. - NEGAUNEE MINE

Two holes, Nos. 50 and 51, were drilled in the Negaunee Mine during the year for a total of 971' and encountered 124' of extremely high sulphur ore. Both were drilled horizontally on the 14th Level.

According to the so-called Amendatory Agreement, dated August 29, 1940, the Negaunee Mine Company was obliged to carry on a program of exploring to determine the downward extent of ore encountered near the shaft at the 13th Level elevation and extending upward to the East. This ore was explored above the 13th Level by a raise and cross-cuts, and found to contain Sulphur in such quantity as to render it unmerchantable. The most practical way of exploring its downward extension was to drill holes 50 and 51 from the drift on the 14th Level connecting with the incline to the sump.

Hole No. 50 was drilled on a course of S. 42° W. to an ultimate depth of 380'. Although it encountered a considerable footage of enriched jasper, averaging from 45.60% to 49% Iron, no high grade ore was found.

Hole No. 51 was drilled on a course of S. 61° W. to an ultimate depth of 591'. It encountered extremely high sulphur ore as follows:

<u>From</u>	<u>To</u>	<u>Amount</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sulphur</u>
373	452	79'	60.08	.074	1.792
495	540	45'	62.34	.079	1.219

After Hole 51 proved that the high sulphur content in this ore above the 13th Level continued to and undoubtedly below the 14th Level, a conference was held with Mr. Russell C. Miller of Negaunee, Michigan, who represents the fee-owners of the Negaunee Mine. All facts and data were placed before him and we convinced him that the ore was not merchantable nor in sufficient tonnage to warrant its economic mining without disturbing permanent surface structures, railway tracks and the main hoisting shaft, itself. He agreed with us that the terms of the Amendatory Agreement had been satisfied and, accordingly, further drilling was discontinued on June 11th.

#### THE ATHENS IRON MINING COMPANY

#### G-16. - ATHENS MINE

A total of four holes, Nos. 13 to 16, inclusive, were drilled in the Athens Mine during the year for a total of 2371'. They encountered 289' of high grade ore.

For a long time we had been waiting for a propitious opportunity to explore the basin of iron formation North of the main East-West greenstone dike which forms the North limit of the present Athens ore body. This work was commenced the latter part of January. Holes 13 and 14 were drilled horizontally from the North side of the main Southwest drift on the 8th Level through the dike into this basin. Hole 13 was drilled on a course of N. 84° W. to an ultimate depth of 795' and encountered high grade ore from 644' to 655' and from 660' to 672'. The first run averaged 61.98% Iron, .055% Phos. and .018% Sulphur. The second run averaged 58.46% Iron, .044% Phos. and .017% Sulphur. The two runs of ore were separated by 53% second class material. Hole No. 14 was drilled from the same location on a course of N. 51° W. to an ultimate depth of 870'. No ore was encountered and drilling was all in footwall slate and graywacke.

Apparently, No. 13 had cut the footwall bulge of a potential ore body. Further drilling at this elevation, however, was impractical on account of inaccessibility of the old workings in which additional holes would have to be located. Accordingly, Holes 15 and 16 were drilled horizontally from the main drift on the 10th Level where it crosses the 1335 W. meridian. This location is about in the center of the main fault dike. Hole No. 15 was drilled on a course of N. 30° W. and encountered a beautiful run of high grade ore from 165' to 342'. This 177' of ore averaged 63.58% Iron, .101% Phos. and .038% Sulphur. The hole was bottomed in footwall slate at 423'. Hole No. 16 was drilled on a course approximately due North. It encountered an Easterly extension of the ore in Hole 15 between depths of 131' and 220'. This 89' averaged 61.94% Iron, .102% Phos. and .012% Sulphur. The hole was bottomed in footwall slate at a depth of 283' on June 15th.

Having been eminently successful in encountering what promises to be an important addition to the Athens Mine reserves North of the main East-West dike, but not desiring to completely define its limits (from a tax standpoint) too far in advance of its development, the drilling was discontinued on the completion of Hole No. 16.

#### ARCTIC IRON COMPANY

#### G-17. - SECTION 5, 47-26 EXPLORATION

The Cleveland-Cliffs Iron Company joined with the Interstate Iron Company in a union drill hole drilled vertically by the latter on the South line of the Arctic Sundry Parcel No. 1 at the Southwest corner of Section 5. The hole, No. 827, was located approximately 320' East of the Southwest corner. It was drilled to a depth of 892' and bottomed in footwall Siamo slate on October 8th. With the exception of 3' of 56% second class ore, from 737 to 740', no enrichment was encountered in the jasper iron formation.

The Interstate Iron Company has been carrying on a vigorous campaign of drilling on their lands in Sections 7 and 8, 47-26 and Hole 827 was located on the North end of one of the cross-sections drilled in this campaign. A considerable footage of ore had been encountered to the South and it was hoped that it might extend on to the Arctic Sundry Parcel No. 1. The results of Hole 827, however, seem to preclude such a possibility. The drilling was done under contract by the E. J. Longyear Company of Minneapolis, Minnesota at a net cost to the Company (one-quarter of the total) of \$1,236.91.

#### THE MESABA-CLIFFS MINING COMPANY

#### G-18. - CANISTEO MINE, SECTIONS 30, 31 AND 32, 56-24, MINNESOTA

The Cleveland-Cliffs Iron Company continued to operate the Canisteco Mine as Agents of the Canisteco Mining Company. Until November 27th, the latter was owned by the Congdon Estate of Duluth, et al. On that date The Cleveland-Cliffs Iron Company purchased two-thirds and the Mesaba-Cliffs Mining Company one-third of the capital stock of the Canisteco Mining Company. The assets of the latter include, among other properties, the underlying leases on the Canisteco and Holman-Brown Mines. At the Canisteco Mine, a total of 39 vertical structure drill holes (Nos. 688 to 726, inclusive) were drilled during the year. They were all located either in the Canisteco Pit or around its perimeter and the total footage of drilling amounted to 3,657'. This developed 1,974' of crude wash ore and jig material. A total of 3,082' was drilled under contract with rigs owned and operated by J. S. Schultze & Sons of Grand Rapids, Minnesota. The balance, or 575', was drilled by Company-operated rigs.

Twenty-nine holes were drilled on the Snyder Leases. Of these, 18 were located on the SW $\frac{1}{4}$  of SE $\frac{1}{4}$ , ten in the SE $\frac{1}{4}$  of SE $\frac{1}{4}$ , and one on the NE $\frac{1}{4}$  of SW $\frac{1}{4}$ ,-- all in Section 30. Ten holes were completed and one started on the Bovey leases. Of these, two were located on the NW $\frac{1}{4}$  of NE $\frac{1}{4}$  and one on the NW $\frac{1}{4}$  of SE $\frac{1}{4}$ , all in Section 30, 56-24. Six holes were located in the NE $\frac{1}{4}$  of NE $\frac{1}{4}$  of Section 31 and one was located in the NW $\frac{1}{4}$  of NW $\frac{1}{4}$  of Section 32, 56-24. All of the drilling was in connection with current mining operations and to determine the ore outline under the present pit banks in order to define stripping operations for its mining.



G-19. - HILL-TRUMBULL MINE, SECTION 17, 56-23, MINNESOTA

Thirty vertical structure drill holes were completed and one partially drilled in the Hill-Trumbull Pit and around its perimeter during the year for a total of 2,585'. This developed 892' of crude wash ore and jig material. All of the work was done under contract by J. S. Schultze & Sons of Grand Rapids, Minnesota.

Thirteen holes (No. H220, No. H220A, and Nos. H221 to H232, inclusive) were located on the Hill Lease and seventeen holes (Nos. T-165 to T-181, inclusive) were located on the Trumbull Lease. All of the drilling was in connection with current mining operations and to determine the ore outline under the present pit banks in order to define stripping operations for its mining.

G-20. - HOLMAN-CLIFFS MINE, SECTIONS 21 AND 22, 56-24, MINNESOTA

Thirty-four structure drill holes (Nos. 266 to 299, inclusive) were drilled vertically in the Holman-Cliffs pit and around its perimeter during the year, for a total of 5,122'. This developed 2,157' of crude wash ore and jig material. All of the work was done under contract by J. S. Schultze & Sons of Grand Rapids, Minnesota.

Three holes were located on the Holman lease, the SE $\frac{1}{4}$  of NE $\frac{1}{4}$  of Section 21. Four holes were located on the Brown No. 1 lease, the SW $\frac{1}{4}$  of NE $\frac{1}{4}$  of Section 21, 11 holes on the Brown No. 2 lease, the SW $\frac{1}{4}$  of NW $\frac{1}{4}$  of Section 22, and one hole on the Brown No. 2 lease, the SE $\frac{1}{4}$  of NW $\frac{1}{4}$ , also in Section 22. The remaining 15 holes were located on the Bingham lease, the NW $\frac{1}{4}$  of SE $\frac{1}{4}$  of Section 21. All drilling was in connection with current mining operations and to determine the ore outline under the present pit banks in order to define stripping operations for its mining. Considerable additional tonnage was added to the reserves of the property, principally in the Holman and Brown No. 2 leases. The engineers' estimate of these extensions has not been completed.

H. EXAMINATION OF MINERAL LAND OFFERS

A total of 33 land offers were received by this office during the year 1945. Twenty-one were mineral lands offers and the remaining twelve were offers of real estate, 11 of which are located in the City of Negaunee and one in the City of Ishpeming. The offers and their numbers are as follows:

<u>Offer No.</u>	<u>Description</u>	<u>Remarks</u>
2319	Lot 16, Block 20, Pioneer Iron Company Plat, Negaunee.	Declined
2320	Various descriptions in Marquette and Baraga Counties.	"
2321	Lot 4, Block 20, Pioneer Iron Company Plat, Negaunee.	"
2322	450 acres of Magnetite lands near Mineville, N.Y.	"
2323	Ringwood Iron Ore Mines, Ringwood Manor, N.J.	"
2324	Lot 7, Block 16, Pioneer Iron Company Plat, Negaunee.	"
2325	Lands of the Cascade Corp. in 47-26, near Palmer, Michigan	Pending
2326	Federal property on the Cuyuna Range, Minnesota.	Declined
2327	Parcel in McKenzie Addition, Negaunee.	"
2328	Waukon Iron Ore Property, near Waukon, Iowa.	"
2329	Iron ore at Goudreau, Ontario, Canada.	"
2330	House and Lot 4, Block 13, Jackson Iron Company Add. Negaunee.	Pending
2331	Property on the Mesaba Range, Minnesota.	Declined
2332	30 acres in SE $\frac{1}{4}$ of SE $\frac{1}{4}$ , Sec. 18, 47-26, including farm buildings	Pending

<u>Offer No.</u>	<u>Description</u>	<u>Remarks</u>
2333	House and Lot 12, Block 6, Jackson Iron Company Addition, Negaunee. \$5,500	Purchased
2334	120 acres in Bates Township, Iron County, Michigan.	Declined
2335	Magnetite in several areas in Ontario, Canada.	"
2336	40 acres in Section 30, 46-26, Marquette County.	"
2337	House and Lot 5, McKenzie Addition, Negaunee.	"
2338	House and South 60', except West 17' of Lot 9, Block 3, Jackson Iron Company Addition, Negaunee.	Pending
2339	Hematite nodules in Placer Deposits in Ohio.	Declined
2340	Two houses and Lot 5, Block 4, Pioneer Iron Company Plat, Negaunee	"
2341	Lowmoor Farm in Sections 8, 9 and 16, 47-28, Michigan	"
2342	House and Lot 3, Block 7, Jackson Iron Co. Addition, Negaunee. \$3,800	Purchased
2343	Surface of $W\frac{1}{2}$ of $SE\frac{1}{4}$ of $NE\frac{1}{4}$ of Section 28, 47-26, near Palmer, Michigan	Declined
2344	720 acres of State mineral lands in Baraga County, public auction.	"
2345	South 30' of Lot 28 of Curry Addition, Ishpeming.	"
2346	House and Lot 10, Boyer Addition, Negaunee. \$6,900	Purchased
2347	$S\frac{1}{2}$ of $SE\frac{1}{4}$ of Section 26, 48-29, Marquette County, Mich.	Declined
2348	$W\frac{1}{2}$ of $NW\frac{1}{4}$ and $NW\frac{1}{4}$ of $SW\frac{1}{4}$ of Section 17, 46-29, Cuyuna Range, Minnesota.	"
2349	Various descriptions in Dickinson, Iron and Marquette Counties, Michigan.	"
2350	About 500 acres near Sagola, Dickinson County, Michigan	Pending
2351	Minerals in $W\frac{1}{2}$ of $SE\frac{1}{4}$ of Section 9, 42-32, Iron County, Michigan	Declined.

## I. METALLURGICAL TESTS AND EXPERIMENTS

### Test Laboratory

The Test Laboratory, located near the Holman-Cliffs Mine office at Taconite, Minnesota, continued to play an important part in the metallurgical study and classification of the crude ore mined in the Canisteo, Hill-Trumbull and Holman-Cliffs Mines, as well as the many samples from drilling and pit sampling at these properties. The work continued under the direction of Mr. George H. Beasley.

### Cone Plant Operation

The Cone, using as a heavy density medium a mixture of ferro-silicon and magnetite, continues to treat the coarse sizes of feed in the Retreat plant at the Hill-Trumbull mill. It is planned to replace the Cone with a 66" Akins spiral classifier type machine in 1946. This will eliminate the air lift in the medium circulating and cleaning circuit and in several other ways, add to the efficiency of the plant.

An additional will be built onto the Retreat plant for the installation of a second Akins machine (72"), together with the necessary screens, etc., for

the heavy medium cleaning circuit, to augment the 66" machine. This will step up the capacity of the plant to treat, if and when necessary, the entire product from the washing plant, as fast as it is produced and will eliminate stockpiling and rehandling the material before it is fed to the Retreat plant. Straight wash ore, in the Hill-Trumbull pit, is nearly exhausted so the percentage of "jig" ore will be increasing rapidly from now on.

Also, starting with the 1946 operations, the product from the Retreat plant will go to the concentrate loading bins in the main washing plant, thus eliminating the extra loading track and personnel to service this separate operation.

#### Selective Media Concentration

The original Selective Media Concentrator, which was put in operation in the Retreat plant at the Hill-Trumbull mill in July, 1944, was augmented by a second unit. It was operated in series with the first machine and together they treated all of the fine material fed to the plant, thus replacing entirely the so-called "Double Classification" circuit formerly employed using Akins spiral classifiers.

The Selective Media Concentrator machine is so new that improvements, principally in its operation rather than design, still are being made. Nevertheless, these machines made as good a product, and with equal iron unit recovery, on  $-3/8$ " feed, as did the Double Classification circuit on  $-3/16$ " feed.

The two Selective Media Concentrator machines used in 1945, and on trial for the first time in the Canisteo Mill, in place of Akins classifiers in treating the log washer overflow, did no better than the Akins machines had done in the past. The apparent explanation is that the material treated was straight wash ore with only fine silica and little or no middling. The machines, in 1946, will be moved to the addition to the Retreat plant at the Hill-Trumbull mill to treat  $-3/16$ " material on that side of the plant.

#### Hydrotator and Hydrosizer

Comparative tests of the Roberts and Schaefer Hydrotator and the Dorr Hydrosizer were made at the Holman mill during the 1945 season. They were placed in parallel, each taking a portion of the overflow from the Akins classifiers in the washing plant. Ordinarily this material is wasted in the tailings basin.

I have had no report summarizing the results of this test and don't believe it has been finished at this time. Oral reports from time to time, however, have advised me that the Hydrosizer did a much better job and recovered an important amount of high grade product from these tailings. The two machines will continue to operate at the same set-up in 1946. The drag on the Hydrotator will be flattened somewhat to try and improve its dewatering ability.

#### Oil Flotation Tests

The pilot plant operation of the flotation testing unit continued at the Canisteo Mill throughout the season of 1945. This operation is conducted

by the Minerals Separation North American Corporation of New York City. The flow sheet is designed to recover the fine iron now being wasted in the tailings basin. In the process being used, the silica is floated and the iron depressed. No formal report has been issued by Minerals Separation and none is expected until the test has been completed. It is expected that the work will be continued in 1946.

Two other flotation tests of pilot size were conducted on the Mesaba Range in 1945. One of these was at the Patrick plant of Butler Brothers. It was operated by the American Cyanamid Company of New York City. In this test the iron was floated and the silica depressed. Pickands Mather conducted a similar test at the Danube mill using its own research staff and personnel.

#### J. EXPENSE STATEMENTS

Tables VII and VIII which follow, show a detailed statement of charges to Geological Expense for the year 1945, and a comparative statement of these charges for the last three years. They are self-explanatory.

TABLE VII

STATEMENT OF CHARGES TO GEOLOGICAL EXPENSE FOR THE YEAR 1945

Salaries	\$ 20,943.50
Travel and Entertainment	2,216.92
Operating Automobiles	1,070.03
Supplies and Office Expense	3,158.89
Personal Injury	-
Unemployment Insurance Tax	212.42
Old Age Benefit Tax	163.40
Unclassified	3,522.89
TOTAL	\$ 31,288.05

TABLE VIII

COMPARATIVE STATEMENT OF CHARGES TO GEOLOGICAL DEPARTMENT  
FOR LAST THREE YEARS

	<u>1945</u>	<u>1944</u>	<u>1943</u>
Salaries	\$ 20,943.50	\$ 18,656.90	\$ 16,089.88
Travel and Entertainment	2,216.92	4,444.20	3,740.22
Operating Automobiles	1,070.03	974.39	993.95
Supplies and Office Expense	3,158.89	3,040.92	2,884.98
Personal Injury	-	-	2.00
Unemployment Insurance Tax	212.42	178.75	140.21
Old Age Benefit Tax	163.40	137.49	112.46
Unclassified	3,522.89	671.43	375.05
TOTALS	\$ 31,288.05	\$ 28,104.08	\$ 24,338.75

Respectfully submitted,

*E. L. Dwyer, Jr.*  
Geologist



