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[Notebook 455: specimens 47706-48867]. No. 455 1913

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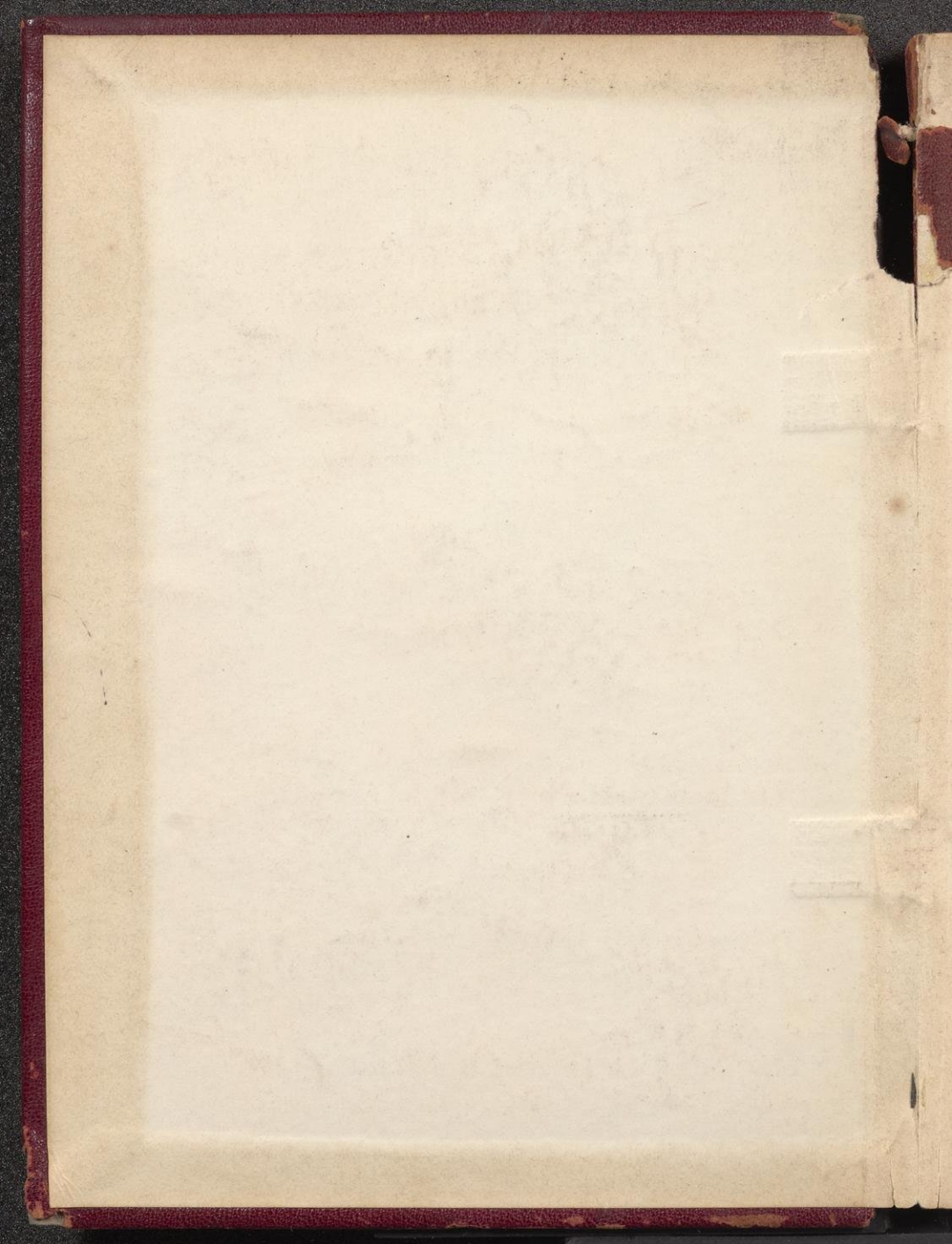
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FIELD SECTION BOOK



455

- 48867 Palmer gneiss from Volunteer mine.
Sec. 30-47-26, Marquette District,
Michigan, Collected by C. K. Leith.
- 48868 Graywacke from crosscut north from the
1st shaft of the Warner shaft. Sec.
9-44-33, Crystal Falls District, Mich-
igan. Sent by R. G. Whitehead (of P-M
Co.) June 5, 1912.
- 48869 Conglomerate pebbles in a matrix of heav-
ily ferruginous quartzite, main south
drift, on 14th level of Hemlock mine,
Sec. 4-44-33, Crystal Falls District,
Mich. (See letter from C. W. Hughes,
May 13, 1912.)
- 48870 SL.17525 Hole 135, #10 pit, Humboldt, 202
-213', Biotitic and chloritic quartz
schist. C. K. Leith, 1913.
Specimen used up in making section.
- 48871 SL.17523 Granulated micaceous quartzite
from near base of Upper Huronian, Hum-
boldt Mine, Hole 139, #10 pit, 210',
Marquette District, Michigan.
Specimen used up in making section.
Sec. in Met. Co.
- 48872 SL.17524 Hematitic quartz schist showing
cordierite from iron formation at Hum-
boldt, Hole 143 #10 pit, 29-41' Mar-
quette District, Michigan.
Specimen used in making section.
Sec. in Met. Co.

S.

T.

R.

	$ \begin{array}{r} 48876 \\ \hline H_2O \quad 0.00 \\ SiO_2 \quad 93.60 \\ FeO \quad 2.47 \\ Fe_2O_3 \quad \\ Al_2O_3 \quad 3.25 \\ K_2O \quad \\ \hline 99.32 \end{array} $	$ \begin{array}{r} 48878 \\ \hline 1.16 \\ 88.20 \\ 2.52 \\ 1.80 \\ 5.72 \\ .12 \\ \hline 99.52 \end{array} $
Assays by Pittsburgh Testing Laboratory, Pittsburgh, Pa., 1913.		

- 48873 * Sample from drill hole in ^T54 N. R. 25
W. 4th P. M., Itasca County, Minn. (See
letter from Chas. F. Hartman, Feb. 6, 13
- 48874 * Laurentian granite. From west of New-
port Mine, Gogebic District, Michigan.
- 48875 * Basal sediments of Upper Huronian plast-
ered against granite. From west of
Newport Mine, Gogebic District, Michigan.
- 48876 * Mesnard quartzite, unmetamorphosed. Mar-
quette district, Michigan.
- 48877 * Mesnard quartzite metamorphosed to dike.
Schist from fissure inclined to bedding.
Marquette District, Michigan.
- 48878 * Mesnard quartzite of the same bed as
No. 1, showing development of cleavage
in S shaped curves crossing the bed.
- 48879 * Mesnard quartzite of the same bed as
No. 1, showing development of cleavage
in S shaped curves crossing the bed.
- 48880 * Goodrich quartzite showing development
of garnet, from Michigamme, Marquette
District, Michigan.
- * Spec. 48874-48880 collected by C. K.
Leith, while on field trip with U. W.
students, May, 1913.

Specimens 48881-48893, Collected by
C. A. Cheney, Jr., Summer of 1913.

48881 Type of lean ore from Bijiki (non-magnetic). From shaft on the NW-SE of Sec. 28-48-29, Marquette Range, Michigan.

48882 Goodrich quartzite from the SE-NE of Sec. 24-47-28, Marquette Range, Michigan.

48883 Ajibic (?) quartzite. Type of numerous large boulders on the NE-SE of Sec. 24-47-28, Marquette Range, Mich.

48884 Rich ferruginous chert from dump of Fitch Mine, Sec. 24-47-28, Marquette Range, Michigan.

48885 Jaspilite from dump of Fitch Mine, Sec. 24-47-28, Marquette Range, Michigan.

48886 Conglomerate at the base of the Goodrich quartzite. Outcropping just NE of the Fitch Mine, Sec. 24-47-28, Marquette Range, Michigan.

48887 Magnetic slate 177 paces west of the $N\frac{1}{4}$ corner of Sec. 34-48-29, Marquette Range, Michigan.

48888 Graywacke 550 paces east and 275 paces north of the $W\frac{1}{4}$ corner of Sec. 34-48-29, Marquette Range, Michigan.

- 48889 Carbonaceous slate from vicinity of shaft on the NW-SW of Sec. 34-48-29.
- 48890 Graywacke 275 paces north of SW corner of Sec. 34-48-29.
- 48891 Graywacke 500 paces east and 100 paces south of the NW corner of Sec. 34-48-29.
- 48892 Crystalline sediment 250 paces west of N $\frac{1}{4}$ corner of Sec. 34-48-29.
- 48893 Graphite from shaft on NW-SW of Sec. 34-48-29
- 48894 Lean jasper. Drill hole No. 151, Milwaukee-Davis Mine, Sec. 7-47-26. Marquette Range, Michigan. Submitted with letter from R. B. Pattison, August 1, 1913.
- 48895 Ore from the 6th level of the Youngs Mine, Sec. 12-42-35, Iron River District, Michigan. Collected by C. K. Leith, June 1913.
- 48896 Drill core from hole No. 23, Depth 415-420 Volunteer Mine, Sec. 30-47-26, Marquette District, Michigan. Collected by C. K. Leith, Summer 1913.
- 48897 Drill core from hole No. 23, Depth 470-475, Volunteer Mine, Sec. 30-47-26, Marquette District, Michigan. Collected by C. K. Leith, Summer 1913.

Sl. 17529

Sl. 17530

Slides:

17532

17533

17534

48898 Specimens of impure quartzite representing the footwall in the Empire Mine, SE-SW, 19-47-26 Marquette District, Michigan. Collected by C. K. Leith, Summer 1913.

48899 Trap from quarry in Keweenaw north of Ironwood, Gogebic District, Michigan showing vein of jaspery material. Under microscope there is a most interesting selvage edge between the contact of vein and diabase. The jaspery material consists of angular quartz grains in a fine-grained matrix of the same type. Looks like an ash. Collected by C. K. Leith, Summer 1913.

48900 Drill core from Hole No. 129 located 300 feet south and 700 feet west of the center of Sec. 16-47-45, Gogebic Range, Michigan. Depth 94 feet. Presented by R. S. Rose, Summer 1913.

48901 Drill core from Hole No. 131 located 1050 feet east and 50 feet south of the W $\frac{1}{4}$ post of Sec. 16-47-45, Gogebic Range, Michigan. Depth 300-305. Presented by R. S. Rose, Summer 1913.

48902 Drill core from Hole No. 203 located 276 feet north and 730 feet east of SW corner of Sec. 12-47-45, Gogebic Range, Michigan. Depth 180-185. Presented by R. S. Rose, Summer 1913.

(Vertical hole)

Bands of dolomite in grey slate.

Specimens 48903-48910 inclusive from Tweed drilling on $N\frac{1}{2}$ - $SE\frac{1}{4}$ and $NE\frac{1}{4}$ - $SW\frac{1}{4}$ of Section 18-47-45, Gogebic District, Michigan, Submitted by C. H. Munger. See his letter of May 12, 1913.

48903 Diorite, fairly fresh. From depth 75-80. Hole #1 located 100' west and 131' south of $E\frac{1}{4}$ corner of Sec. 18-47-45, Gogebic District, Michigan.

48904 Diorite, soft and altered. From depth 390-395 Hole #1 located 100' west and 131' south of $E\frac{1}{4}$ corner of Sec. 18-47-45, Gogebic District, Michigan.

48905 Foot quartzite. From depth 685-690, Hole #1 located 100' west and 131' south of the $E\frac{1}{4}$ corner of Sec. 18-47-45, Gogebic District, Michigan.

48906 Altered diorite. From depth 455-460 Hole #2, located 300' west and 331' south of $E\frac{1}{4}$ corner of Sec. 18-47-45, Gogebic District, Michigan.

48907 Quartzite (soft) From depth 300-305, Hole #4, located 700' west and 531' south of $E\frac{1}{4}$ corner of Sec. 18-47-45, Gogebic District, Michigan.

48908 Quartzite. From depth 310-315. Hole #4 located 700' west and 531' south of $E\frac{1}{4}$ corner off Sec. 18-47-45, Gogebic District, Michigan.

48909 Quartzite. From depth 170-175'. Hole #5, located 33' west and 774' south of the center of Sec. 18-47-45, Gogebic District, Michigan.

48910 Quartz slate. From depth 185-190', Hole #5, located 33' west and 774' south of the center of Sec. 18-47-45, Gogebic District, Michigan.

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48911-48917 inclusive from Tweed drilling on $N\frac{1}{2}$ -SE and SE-NE Sec. 13-47-46 and NE-SW of Sec. 18-47-45, Gogebic District, Michigan. Submitted by F. K. McIntosh. See his letter April 24, 1913.

48911 From Hole #1, located 400' south and 400' west of $E\frac{1}{4}$ post of Sec. 13-47-46, Gogebic District, Michigan.

48912 Sl. 17535 From Hole #1, located 400' south and 400' west of $E\frac{1}{4}$ post of Sec. 13-47-46, Gogebic District, Michigan.

48913 From Hole #2, located 20' south and 400' west of $E\frac{1}{4}$ post of Sec. 13-47-46, Gogebic District, Michigan.

48914 From Hole #2, located 20' south and 400' west of $E\frac{1}{4}$ post of Sec. 13-47-46, Gogebic District, Michigan.

48915 Near surface, Hole #3, located 20' south and 1700' west of E $\frac{1}{4}$ post of Sec. 13-47-46, Gogebic District, Michigan.

48916 Depth 100-250, Hole #4, located 600' north and 650' west of E $\frac{1}{4}$ post of Sec. 13-47-46, Gogebic District, Michigan.

48917 Depth about 120', Hole T, located 600' south and 60' west of center of Sec. 18-47-45, Gogebic District, Michigan.

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48918-48922 inclusive from M. A. Hanna Company drilling on Secs. 12, 16 & 17-47-45, Gogebic District, Michigan. Obtained by C. K. Leith, Summer 1913.

48918 From Hole #201, Depth 305' Sec. 12-47-45.

48919 From Hole #201, Depth 320' Sec. 12-47-45.

48920 From Hole #124, Depth 230' Sec. 16-47-45.

48921 Sl. 17536 Hole #106, Depth 295-300' Sec. 17-47-45.

48922 Sl. 17537 Hole #118, Depth 165-168' Sec. 17-47-45.
(Slide in Metamorphic Collection)

- 48923 Altered quartzite or soapstone, the overlying formation in Hole No. 28, Sec. 30-47-26, near Volunteer Mine. Submitted by Thomas Pellow, General Superintendent, Volunteer Ore Company, December 3, 1913.
- 48924-48926 Inclusive, from M. A. Hanna Company drilling on 47-45, Gogebic District, Michigan. Submitted by Robert S. Rose, January, 1914. Detailed locations of holes not available.
- 48924 From hole #136, Depth 181'.
- 48925 " " 137, " 95'.
- 48926 " " 138, " 110-115'.
- 48927 Limonite from Sawyer County, Wisconsin. Submitted by W. N. Smith, Jan. 18, 1914.
- 48928 Zinc ore from Century Zinc Company's Mine near Joplin, Missouri. Presented by W. N. Smith, January, 1914.
- 48929 Garnetiferous chlorite schist from Michigamme Mine, Marquette Range, Mich. Collected by C. K. Leith, Met. Coll.
- 48930 Typical ore from Calumet Mine, Sec. 8, 41-28, Crystal Falls District, Mich. Collected by C. K. Leith, April 26, 1914.
- 48931 Silicated dolomite from Calumet Mine, Sec. 8, 41-28, Crystal Falls Dist., Mich. Collected by C. K. Leith, Apr. 26, 1914. Met. Coll.

- 48932-48936 Samples of "iron ore" from claims in the district of Patricia, Province of Ontario, Canada, situated about 30 miles north of station of Qu'Appelle, on the Canadian Pacific Ry. Submitted by Samuel Mather, of Pickands, Mather & Company, with letter of March 12, 1914.
- 48937-48952 Specimens from claims of W. E. Smith, near Rush Lake, Woman River District, Ontario and from Moose Mountain. For descriptions see Notebook No. 465
- 48953 Iron formation from north of Wentworth, Douglas Co., Wis., near the sandstone contact. Presented by Paul C. Stack, September 25, 1914.
- 48954 Feldspar and mica from pegmatite dike located 100 paces west and 125 paces north of SE corner Sec. 23, 46-30, near Republic, Crystal Falls Dist., Mich. Collected by H. M. Roberts, Oct. 6, 1914. See his report of that date to W. M. Mead.
- 48955 Geneva Lake Magnetite, from near Cartier and Straight Lake, Ontario. Presented by W. E. Smith, Sudbury, Ont. Nov., 1914
- 48956 Conglomerate from the south end of the 14th level of the Michigan Mine, Crystal Falls Dist., Mich. Presumably marks an unconformity between the iron bearing series and an overlying series of slates. Submitted by Hemlock River Mining Co., Nov. 17, 1914.

- 48957 Representative material from depth 800' - 860 feet in drill hole No. 41 near Presquele Mine, NW-SW, Sec. 21, 47-43, Gogebic District, Michigan. Exploration by Messrs. LaRue and White-side. Submitted by W. G. LaRue, Dec. 1914.
- 48958 Samples of ore and rock associated with it, usually in the form of seams embedded in the layers of ore, and running quite regular, with the exception of some quartz seams that run crossways and in all directions through the formation. From Amasa-Porter Mine, Sec. 22, 44-33, Crystal Falls Dist., Mich. Submitted by M. E. Richards, Jan. 20, 1915.
- 48959 Iron formation from footwall cross-cut 130' level, Amasa Porter Mine, Sec. 22, 44-33, Crystal Falls Dist. Submitted by M. E. Richards, March, 1915.
- 48960 Ferruginous slate from footwall cross-cut 130' level, Amasa Porter Mine, Sec. 22, 44-33, Crystal Falls Dist. Submitted by M. E. Richards, March, 1915.
- 48961 5 to 10' from breast 40 to 50' north-east of shaft, 130' level, Amasa Porter Mine, Sec. 22, 44-33, Crystal Falls Dist. Submitted by M. E. Richards with letter of April 2, 1915.

- 48962 1 to 5' from breast 45 to 50' northeast of shaft, 130' level, Amasa Porter Mine, Sec. 22, 44-33, Crystal Falls Dist. Submitted by M. E. Richards with letter of April 2, 1915.
- 48963 Breast of drift 50' northeast of shaft, 130' level, Amasa Porter Mine, Sec. 22, 44-33, Crystal Falls Dist. Submitted by M. E. Richards with letter of April 2, 1915.
- 48964 Slate from brecciated mass north of Spencer shaft on Federal property. Sec. 25-40-31, Menominee district, Mich. For field notes see Notebook 468. Collected by C. K. Leith, June, 1915.
- 48965 Specimen of clean ore from formation on NE-NE of Sec. 6, 47-29, Marquette district, Michigan. Submitted by W. B. Pattison with letter of September 25, 1915.
- 48966 Specimen of ore from W $\frac{1}{2}$ -of Sec. 32-47-29, Marquette District, Michigan. Submitted by W. B. Pattison with letter of Sept. 25, 1915.
- 48967 Piece of red slate band up to 12 feet thick which lies about 75 feet from the footwall in the Palms Mine, Sec. 14, 47-46, Gogebic District, Michigan. Collected by C. K. Leith, October 1915. This band was thought to be dike by the local men.

48968. Banded iron formation with sandy texture from 19th level of Newport Mine, Sec. 24, 47-47, Gogebic District, Michigan. At coordinates 2150 east and 2430 north on 19th level map. Collected by C. K. Leith, October, 1915.
- 48969 Iron formation from 19th level, Newport Mine, Sec. 24, 47-47, Gogebic Dist. Michigan. At coordinates 430 east and 1600 north on 19th level map. Collected by C. K. Leith, October 1915.
- 48970 Titaniferous magnetite from Namekan Range, Minnesota (Township 58-19). Submitted by Francis E. McGovern with letter of May 22, 1916.
- 48971 Iron formation from drill hole #170, above 262 feet, Breitung & Co. property, Sec. 8-47-26, Marquette Dist., Michigan. Submitted by W. B. Pattison with letter of Sept. 30, 1916. x
- 48972 Drill sample from bottom of hole #170 at depth 310', Breitung & Co. property, Sec. 8-47-26, Marquette Dist., Michigan. Submitted by W. B. Pattison with letter of October 3rd, 1916. x
- 48973 Drill sample from depth 140', drill hole #23, Star Forty, Breitung & Co. property, Marquette Dist., Michigan. Submitted by W. B. Pattison with letter of October 3rd, 1916. x

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48974-48980 Drill samples from hole
#172, Star 40, 8, 47-26, Breitung & Co. X
property, Marquette district, Michigan,
Submitted by W. B. Pattison with let-
ter of December 8, 1916.

48974 Depth 41- 46' Iron formation
48975 46-147' Dike
48976 147-216' Slate
48977 216-304' Iron formation
48978 304-406' Iron formation
48979 406-481' Slate
48980 Last core from hole. Slate.

48981-48983 Specimens from SE $\frac{1}{4}$ of Sec-
tion 14, 42-35, Iron River District,
Michigan. Submitted by Chas. E. Lawrence
with letter of Dec. 8, 1916 (letter fil-
ed under Sec. 14-42-35, Mich.)

48981 From slate outcrop on west line of prop-
erty.
48982 Ferruginous slate adjoining above on
east.
48983 Limestone across the valley about a
thousand feet to the east.

48984-~~46800~~. Drill samples from hole X
#173, Star 40, 8, 47-26, Breitung & Co.
Marquette Dist., Mich. Submitted by
W. B. Pattison, Dec. 25, 1916.

48984 Depth 26- 30'
48985 52- 60
48986 86- 96
48987 109-117
48988 139-142
48989 161-168

48990 191-202
48991 225-232
48992 232-247
48993 247-262
48994 273-286
48995 295-307
48996 307-319
48997 330-340
48998 359-371
48999 399-412

46800 440-456

46801. South side of pit #6. Conglomerate phase of Goodrich quartzite containing considerable specular hematite. (schistose).
46802. Outcrop two paces NW of SE corner Sec. 3. Banded jasper and specular hematite (Ore?)
46803. Outcrop at east end of #5 pit. Banded jasper and specular hematite. (Ore?) Shows considerable leaching of silica.
46804. Outcrop at east end of #5 pit. Just north of Specimen 46803. Leaner phase of banded jasper and specular hematite.
46805. Outcrop at east end of #5 pit. Just south of Specimen 46803. Impure phase of the iron formation.

46806. Outcrop at west end of #1 pit. Conglomerate phase of Goodrich quartzite.
46807. Outcrop west end of #1 pit. Just north of Spec. 46806. Impure schistose phase of banded iron formation.
46808. Outcrop west end of #1 pit. Just south of #6 Specimen. Goodrich quartzite. Partly conglomerate phase.
46809. Outcrop in east part of No. 6 pit. Very hard iron formation (hard ore ?)
46810. Outcrop in east part No. 6 pit. Just S. E. of Spec. 46809. Iron formation, very hard. Some specular hematite.
46811. Outcrop south side of No. 6 pit. Schistose phase of Goodrich quartzite. Conglomerate very close to contact with iron formation on north. Some specular hematite, probably secondary.
46812. Outcrop southeast corner of No. 6 pit. Conglomerate phase of Goodrich quartzite.
46813. Outcrop southeast of No. 1 pit. (On neck between pits.) Impure schistose amphibole magnetite phase of iron formation.
46814. South side of No. 1 pit. Basal conglomerate phases of Goodrich quartzite.

46815. South side of No. 1 pit. Just north of Specimen 46814. Conglomerate phase of Goodrich quartzite.
46816. South side of No. 1 pit. Specimen taken just south of 46815. Goodrich quartzite.
46817. Outcrop south side of pit, just south of New York forty. Goodrich quartzite.
46818. Outcrop. Knob at East New York Mine. Banded jasper.

46819-46826. Hole 173, Chicago, 7, 47-25.
Submitted by W. B. Pattison.

46819	482-498
46820	539-551
46821	551-563
46822	570-583
46823	583-598
46824	398-613
46825	638-653
46826	713-725

46827-46837, Hole 174, Himrod, 7, 47-26.

46827	32- 40
46828	102-111
46829	174
46830	188-192
46831	220-224
46832	232-237
46833	274-280
46834	331-339

18X

46838-46853 Hole 175, Himrod, 7, 47-26.

46838. 17- 25
46839 41- 47
46840 82- 95
46841 117-129
46842 173-185
46843 234-251
46844 280-291
46845 306-321
46846 351-367
46847 376-393
46848 441-454
46849 477-489
46850 537-550
46851 564-581
46852 667-687
46853 769-771
46853 821

46854-46858, Hole 179)
46859-46861, Hole 180) Breitung-Hematite
6, 47-26.

46854 152-172
46855 213-231
46856 305-314
46857 349-360
46858 390-397

46859 189-200
46860 262-269
46861 313-322

46862 Soaprock dikes in Mesabi iron formation, Elba district. These are locally called granite, but may represent alteration of basic intrusives. Collected by C. K. Leith, September 1920.

46863 Taconite from Scranton Mine, Mesabi District. Collected by C. K. Leith, September 1920.

46864 Paint rock, possibly porphyry, from Pioneer
Sl. 17576, 17577 Mine, Vermilion district, Minnesota.
Collected by C. K. Leith, March 1920.

46865 Paint rock, possibly porphyry, from Zenith
Sl. 17577. Mine, Vermilion district, Minnesota. Collected by C. K. Leith, March 1920.

46,866, 46867 and 46868 from Balkan Mine, Sec. 13, 42-33, Crystal Falls District, Michigan. Submitted with letter from W. J. Perkins, Oct. 15, 1919. See reply of Stephen Royce of Oct. 22, 1919.

46866 Dike from footwall of main ore body on third level.

46867 Tuffaceous phase of sandy iron formation, bounding the ore on the west.

46868 Slaty iron formation or ferruginous slate, directly behind material of which Spec. No. 46867 is a sample.

Specimens from Joyce-Watkins lands in the vicinity of Point Mamainse, Ontario. Collected by Stephen Royce, summer of 1918.

46869. Quartzite (?) from footwall of iron formation.
Microscopic examination:

Slides
#17578
17579

Locality. From west end of lean ore outcrops.

Occurrence. Found along south edge of the iron formation, on foot. This specimen from immediately below iron formation.

Hand specimen. Appears to be a vitreous, recrystallized quartzite, stained with limonite. Somewhat sheared and broken. Shows stains of limonite and some dark mineral, also a little pyrite. Closely resembles the more glassy phases of the Gogebic Range quartzite.

Thin section. Shows a rock made up almost entirely of quartz crystals with a little pyrite, a little magnetite, some limonite, a very little amphibole. Some traces of granular form can be observed.

Determination. A very vitreous quartzite, sheared, contorted and recrystallized. Grades south into 46870.

46870. Quartzite (?) from footwall at west end of iron outcrops.

Microscopic examination:

Slides
#17580
17581

Locality. From west end of lean iron ore outcrops.

Occurrence. Found south of iron formation in footwall. Grades north into 46869 and south into 46871.

Hand specimen. Appears to be a very fine grained quartzite or quartz slate.

Thin section. Quartz, about 75%, amphibole,

magnetite and pyrite. Granular structure shown in some places. Marked parallelism of quartz crystals. Amphibole is in roughly parallel streaks along planes of shearing.

Determination. A metamorphic quartz slate.

46871. Quartzite (?) diorite contact from footwall side of west end of outcrops.

Slides

#17582

17583

Microscopic examination:

Locality. West end of outcrops of lean ore.

Occurrence. Grades north into 46870 and south is cut off by a fine grained diorite which extends southward for upward of 1/4 mile.

Hand specimen. Shows a hard, pinkish, dense rock with small gray granules in contact with a dark, medium-grained diorite.

Thin section. Shows some quartz, in rounded particles resembling grains, some quartz in a finely interwoven ground mass, and a large amount of feldspar (orthoclase) a little amphibole, considerable pyrite and magnetite.

Determination. Contact phase of quartzite.

46872. Specimen of hematite-magnetite from test pit.
Slide #17584.

46873. Specimen of lean iron formation from west end of formation.

Slides

#17585

17586

46874. Specimens from west end outcrops on Joyce-Watkins iron formation. Note leaner character than on east end specimens. Compare.

46875. Diorite from bluff south of formation.

46876. Specimen from native copper vein about 1/8 mile south of Joyce-Watkins line.

46877. Specimens of molybdenite from large chunk of vein matter at north end of Smith Lake, Sec. 12, Ryan, Ontario.
46878. Specimen of iron formation from east end of Joyce-Watkins outcrops. Note richer character than west end. Compare.
46879. Specimen of ore from 6" to 12" vein in tunnel below falls. Watkins.
46880. Specimens from Cu-Ag-Na vein just south of Joyce-Watkins boundary.
46881. Diorite (altered) from south of iron formation Joyce-Watkins claim. Q. and L. S. M. Co., Ontario, Sault Ste. Marie District.
46882. Specimens of copper impregnation of iron formation close to quartz vein at north end of Smith Lake, Sec. 12, Ryan township, Ontario. Cu Fe S₂ Cu₂ S. July 31, 1918.
46883. Specimen largely of calcite from pegmatite vein at north end of Smith Lake, Sec. 12, Ryan Township. Traces of molybdenite. Yellow and red staining not yet tested. August 31, 1918. Ont.
46884. Specimens from flat lying quartz stringer at north end of Smith Lake, Ryan, Ontario, Sec. 12. Mo S₂ and Cu Fe S₂.
46885. Hematite-magnetite. Specimens from east end of Watkins outcrops. Specimens obtained from test pit July 28, 1918. Pit is on north edge of formation.

46886. Magnetite and hematite from test pits east of outcrops of iron formation on Joyce-Watkins July 28, 1918. Sault St. Marie Dist., Ontario, Q. and L. S. M. Ass., Cape Mamainse. Claim near east end.
46887. Copper specimens (Cu Fe S_2 and $\text{Cu}_3 \text{Fe S}_3$) from quartz vein at north end of Smith Lake, Sec. 12, Ryan township, Ontario.
46888. Intrusive granite near iron formation on foot-wall side.

Coeur d' Alene District, Idaho. Specimens collected by J. D. Conover, summer of 1920

46889. Characteristic bluish St. Regis formation from south side of Mullan-Wallace road.
46890. Characteristic Wallace slate from south side of Mullan-Wallace road.
46891. Sheared Upper Revet-Lower St. Regis from Morning #5 Tunnel.
46892. Granite (?) from east side of adit tunnel. Frisco #2. Notebook, p. 35).
46893. Diabase (?) from shaft crosscut Gem #3 tunnel.
46894. Material from O'Neill Gulch fault (?) #2 cut off of Hecla #3 tunnel, south side.
46895. Material from O'Neill Gulch fault (?) #2 cut off of Hecla #3 tunnel, north side.

46896. High manganese iron ore from Bengal Mine,
Sec. 36-43-35, Iron River District, Michigan.
Submitted by Stephen Royce, Crystal Falls,
Michigan, with letter of May 18, 1921.
(thin section #17625).

46897. Sample from east end of Carpenter ore body of Judson Mine on 3rd level close to line between Carpenter and Longyear forties showing gypsum. Submitted by Stephen Royce with letter of April 11, 1922.

46898. Sample from same drift as above showing pyrite. Submitted by Stephen Royce, with letter of April 11, 1922.

46899-46902. Specimens from Judson Mine taken in the attempt to show the association of sulphur minerals in the Carpenter ore body. Submitted by Stephen Royce with letter of April 19, 1922. (See accompanying maps for locations from which specimens were taken).

46899. Average specimen of ore with about the usual proportion of sulphur minerals showing. Taken on the third level just south of the 4th level connection raise from areas of .613 sulphur, (See map of third level).

46900. Pyritic samples from just north of Specimen 46897, third level.

46901. Sample to show relation of sulphur minerals to silica. From south part of ore body near the northwest end from area 1.236 sulphur. (See map of third level).

46902. Gypsum sample from 25' sub, 3d level. (see map). One specimen taken from this locality ran 18' in sulphur.

46903. Coarsely crystalline manganese ore from manganese ore body at north end of 3rd level Bengal mine (36-43-35, Iron River District, Michigan). Submitted by Stephen Royce with letter of Oct. 18, 1922.
46904. Steely manganese ore from south side of manganese ore body at north end of 3rd level Bengal mine (36-43-35, Iron River District, Michigan). Submitted by Stephen Royce with letter of Oct. 18th, 1922.
46905. Manganese ore from Judson mine (13-42-33, Crystal Falls District, Michigan), 319 ore body. Submitted by Stephen Royce with letter of Oct. 18th, 1922.
- Sl. 17639 46906. Sill occurrences from 7th level Amasa-Porter mine (22-44-33, Crystal Falls District, Michigan). Submitted by Stephen Royce with letter of Oct. 18th, 1922.
- Sl. 17640 46907. From coordinates 1010 north, 80 east, No. 3 west crosscut Buck mine (6-42-34, Iron River District, Michigan). Submitted by Stephen Royce with letter of Dec. 23rd, 1922.
- Determination by Edward Steidtmann:
46908. "Fine-grained phyllite. Chief constituent chlorite. Other constituents, iron oxides, a very fine-grained colorless mineral, and a mica-like mineral with positive sign, positive elongation and moderate birefringence."

46908. From coordinates 375 north, 155 west,
Sl. 17641 5th level, Fogarty mine (1-42-35, Iron
River District, Michigan), next to the
blocky black slate. Submitted by
Stephen Royce with letter of Dec. 23,
1922. Determination by Edward Steidtmann:
"Largely red iron oxide. A lot
of very fine-grained angular quartz and
feldspar embedded in iron oxide. A few
shreds of a mica-like mineral. Angular
quartz and feldspar is undoubtedly frag-
mental.
46909. Specimens from 319 ore body, Judson mine
(13-42-33, Crystal Falls District, Mich.)
showing the ore in association with
siderite(?). Submitted by Stephen Royce
with letter of Dec. 23rd, 1922.
Determination by Edward Steidtmann:
"Contains an amorphous serpentine -
deweylite. White coating is calcite."
46910. "Conglomerate" from coordinate 770 south,
1125 west, 6th sublevel of Porter mine
(22-44-33, Crystal Falls District, Mich.)
Submitted by Charles E. Lawrence with
letter of July 26th, 1923.

46911. Cherty quartzite in upper horizon of
 46912. dolomite in 9th level cross cut, East
 Central Mine (Penn Group), Sec. 10-39-29,
 Menominee range, Michigan. This is 100
 feet or more below the Traders quartzite.

46913 From holes 4 and 5, Sec. 3-43-31 near
 to Michiganne Mountain, submitted by Ford
 46975 Motor Company with letter of July 28, 1925,
 addressed to President Van Hise. See ac-
 companying blue prints.

Hole 4.

46913	151 - 218
46914	218 - 238
46915	238 - 340
46916	340 - 390
46917	390 - 435
46918	435 - 480
46919	480 - 500
46920	500 - 630
46921	630 - 680
46922	680 - 725
46923	680 - 725
46924	725 - 750
46925	750 - 870
46926	870 - 900
46927	900 - 1000
46928	1000 - 1035
46929	1035 - 1045
46930	1045 - 1170
46931	1170 - 1190
46932	1190 - 1230
46933	1230 - 1295

Hole 4 Continued.

46934	}	No depths given.
46935		
46936		
46937		
46938		
46939		
46940		

Hole 5 Sec. 3-43-31.

46941	145 - 153
46942	153 - 235
46943	235 - 255
46944	255 - 265
46945	265 - 280
46946	280 - 350
46947	350 - 360
46948	360 - 400
46949	400 - 440
46950	440 - 520
46951	520 - 530
46952	530 - 710
46953	710 - 725
46954	725 - 780
46955	710 - 780
46956	780 - 810
46957	810 - 830
46958	830 - 840
46959	840 - 890
46960	890 - 1065
46961	1065 - 1070
46962	1070 - 1100

Hole 5 Continued.

46963 1100 - 1180
46964 1180 - 1190
46965 1190 - 1216

46966
46967
46968
46969
46970 No depths given.
46971
46972
46973
46974
46975

46976 Carbonaceous slates (34% carbon) from
46977 Upper Huronian near L'Anse, Michigan, on
NE $\frac{1}{4}$ of NE $\frac{1}{4}$ of Sec. 16-49-33. These are
being shipped to Detroit for paint manu-
facture. Collected by C. K. Leith in com-
pany with Mr. L. P. Barrett, July 1924.
See also letter from Mr. Barrett to C. K.
Leith, July 24, 1924, in general file.

46978-46980, typical samples from SW $\frac{1}{4}$ of Sec. 27-47-26, Marquette Range, Michigan. (Siliceous iron ore property). Submitted by Stephen Royce, with report of August 27, 1924.

46978 Typical carbonate iron formation (high silica ore)

46979 Typical siliceous iron formation (high silica ore).

46980 Typical massive flinty chert. This is material classified as chert in Royce report of Aug. 27, 1924.

46981 *near contact with the ore,*
Weathered sill, from Plymouth Mine, Sec. (sl. 17653) 18-47-45, Gogebic Range, Michigan. Submitted by Pickands, Mather & Co., Sept. 1924. See letter from C. K. Leith to Mr. W. P. Chinn, Sept. 13, 1924 (filed under Plymouth Mine).

46982 Samples of iron ore from Heck claims, Hanes Lake, Ontario. Submitted by Pickands, Mather & Co. with letter of September 17, 1924.

46983 Siliceous capping on granite beneath slates,
Sl. 17658 from hill west of Newport Mine, Gogebic dist.,
" 17659 Michigan. Collected by C. K. Leith.

46984
Sl. 17660

46984-46986 from Empire Mine, SW $\frac{1}{4}$ of
Sec. 19-47-26, Marquette dist., Mich.
Collected by C. K. Leith. See letter
to Stephen Royce, June 18, 1925.
(Specs. 46984 and 46985 used up in
making thin sections).

46985
Sl. 17661

46986
Sl. 17662

46987

vacant?

46988-46993 from Volunteer Mine, Sec. 25-
47-27 and Empire Mine, Sec. 19-47-26,
Marquette dist., Mich., submitted by
Stephen Royce with letter of June 22, 1925.

46988
Sl. 17663

Volunteer Mine. Hole 16, depth 110-115'.

46989
Sl. 17664

Volunteer Mine. Hole 16, depth 110-115'.

46990
Sl. 17665

Volunteer Mine, Hole 16, depth 115-120'.

46991
Sl. 17666

Volunteer Mine, Hole 16, depth 150-155'.
Analyzed by Lerch Bros. for titanium.
None found.

46992
Sl. 17667

Empire Mine. Hole #1, depth 34'.
Carbonate formation. Analyzed by
Lerch Bros. for titanium. None found.

46993
Sl. 17668

Empire Mine. Hole #1, depth 39'.
Banded carbonate formation.

46994
Sl. 17669 Empire Mine, Hole #2, depth 45'.
Submitted by Stephen Royce with
letter of June 25, 1925.

46995
Sl. 17670 Empire Mine, Hole #2, depth 135'.
"Graywacke". Submitted by Stephen
Royce with letter of June 22, 1925.

46996-46998 from Volunteer Mine,
Sec. 25-47-27, Marquette Dist., Mich.
Submitted by Stephen Royce with letter
of June 27, 1925,

46996
Sl. 17671 Hole #24. No depth given.

46997
Sl. 17672 Hole #24, depth 50-55'.

46998
Sl. 17673 Hole #24, depth 65'.

46999 Iron formation from Altura Property,
18 miles north of Dupuy, Quebec.
Presented by H. D. Squires, 1928.

- 47663 Carbonaceous rock from Keewatin greenstones, Zenith Mine, Vermilion Dist., Minn. Collected by C. K. Leith, July 1927. (Placed in Pre-Cambrian by Dists. Coll.)
- 47664 Paint rock (altered greenstone) Zenith Mine, Vermilion Dist., Minn. Collected by C. K. Leith, July, 1927. (Placed in Met. Coll.)
- 47665 Leached quartzite. Isabella Mine, Marquette Dist., Mich. Submitted by Stephen Royce with letter of July 30, 1927.
- 47666 Fresh quartzite. Same.
- 47667 Iron form. just above quartzite. Same.
- Sl. 47668 } Errington Mine, near Sudbury, Ont.
 17674 } Collected by C. K. Leith. August, 1927.
 47669 }
- 47670 } 9th level, East Vulcan Mine, Menominee
 47671 } Dist., Mich. Submitted by Stephen Royce
 47672 } with letter of Jan. 18, 1928.
- Sl. 47673 } Anvil Mine, Sec. 14-47-46, Gogebic
 17675 } Dist. Mich. 12th level south cross
 Sl. 17676 } cut under the Eureka fault, i. e. south
 47674 } of the main quartzite and in the quartz
 Sl. 17677 } slates. Submitted by H. W. Johnson
 with letter of Apr. 11, 1928. Classified
 by C. K. Leith as fine-grained diabase
 (dike material).

47675 Ferruginous slate from Buch expl.
in Sec. 16-38-28 near Faithorn,
Mich. Submitted by Stephen Royce
with letter of Aug. 8, 1928.
(Menominee Dist.).

47676 & 47677 from Warner Mine,
Sec. 9-44-33, Crystal Falls Dist.
Mich. Submitted at request of
Stephen Royce by W. J. Trestrail
with letter of Dec. 8, 1928.

47676 Drill Hole #12, Chert at depth of
about 79'.

47677 Drill Hole #12. Slate from 108'

47678-47683 Collected by Kenneth
Leith in Crystal Falls Dist., Mich.
during Magnetometer Survey, summer
of 1928.

Sl. 47678 Angular float, 100 paces SW of
17678 center of SW-SW of Sec. 1-43-33.

Sl. 47679 Angular float, center of SW-SW
17679 Sec. 1-43-33 on mag. line.

Sl. 47680 From well, 350 paces east of center
17680 of Sec. 17-44-33. 65' deep.

Sl. 47681 300' SW of SW cor. of SE-NW Sec.
17681 17-44-33.

47682 From center of outcrop. SW corner of
Sl. 17682 SE-NW of Sec. 17-44-33.

47683 100' NE of SW corner of SE-NW of Sec.
Sl. 17683 17-44-33

47684 Samples of carbonate from Volunteer
siliceous property, NE $\frac{1}{4}$ of Sec. 25-47-27,
Marquette Dist., Michigan. Submitted
by Pickands, Mather & Co., 1930.

47685 Samples of hematite from Volunteer
siliceous property, NE $\frac{1}{4}$ of Sec. 25-47-27,
Marquette Dist., Michigan. Submitted
by Pickands, Mather & Co., 1930.

47686 Samples of siderite from Helen siderite
property, Michipicoten District, Ontario.
Submitted by Algoma Steel Corporation,
August, 1930.

47687 Typical sample of siderite from Helen
siderite property of the Algoma Steel
Corporation, Michipicoten Dist., Ontario.
Collected by C. K. Leith, September,
1930.

47688 Manganiferous carbonate underlying
Sl. 17684 Sagamore ore. Sagamore Mine, Geyuna
Range, Minn. Collected by C. K. Leith,
July 1931.

(see also next page)

Sample # 47688 Dr. C. K. Leith

Description: Fine grained (average about .005 mm). Contains highly birefringent grains, difficulty resolved by high power. About 10 per cent insoluble in hydrochloric acid.

Methods: Sample ground and separated by gravimetric methods. Bulk of sample fell between 3.1 and 3.5 specific gravity. About 25 per cent of sample lighter than 3.1 and heavier than 2.9 specific gravity. Qualitative borax bead test for Mn made on each gravity separation showed a concentration of Mn in the heavies with a lesser amount in the lights. An optical study of the indices and X-ray study of each separate showed the manganese mineral to be Manganocalcite. The composition of the Manganocalcite covers a range in the sample from about 32 per cent rhodochrosite to 65 per cent.

Note: The gravimetric methods are modified standard procedure. The optical methods are published in the American Mineralogist.

Theodore D. Tiemann.

Copy to D.F.Hewett, Nov. 17, 1931.

Theodore D. Tiemann

47689 Typical hematite from Tonkolili Valley near Gbonbomba, Sierra Leone, western Africa. $11^{\circ} 40'$ Long., $9^{\circ} 00'$ Lat. Presented by Mrs. Katharine Fowler Lunn, May 1932. (see map, analyses and other data filed under "Africa".)

47690 Wissahickon mica schist (sedimentary), from north of Baltimore, Maryland. Collected by C. K. Leith, July 1933, on excursion of International Geological Congress.

Specimens 47691 to 47699, incl., from titanium properties near Magnet, Arkansas. Submitted by A. G. Johnson, Century Zinc Co., Baxter Springs, Kansas, with his letter of Nov. 27, 1933 (filed under Titanium Deposits of Arkansas). Samples Nos. 1 to 6 are titanium concentrates produced in the mill of the Titanium Corporation of America, located near Magnet, Arkansas.

47691 Sample #1. Product of electro-magnetic separator, averages 47% TiO_2 .

47692 Sample #2, same, averages 57.4% TiO_2 .

47693 Sample #3, same, averages 86.2% TiO_2 .

47694 Sample #4, same, averages 92% TiO_2 .

47695 Sample #5, high grade concentrates taken from bag supposedly containing extra high-grade concentrates. Averaged 95.1% TiO_2 .

47696 Sample #6, final product of concentrating tables before going to dryer and separator. Average 68.70% TiO_2 .

47697 Rutile crystals picked up on the surface of this property. Average 91.1% TiO_2 . Considerable clayey material in indentations of these jagged crystals. Were this removed sample

would undoubtedly run 2% to 3% higher.

- 47698 Specimen of titanium ore which was encountered in shaft, supposedly coming from drifting on the 81 foot level.

- 47699 Rutile pebbles washed from clayey gravel, from gravel property of H. R. McKnight located about 4 miles south of property of Titanium Corporation of America. Analysis 94% TiO_2 .

- 47700 Drill core from Hollinger gold mine, Porcupine district, Ontario, showing typical formation and ore. Presented by A. H. Wohlrab, Asst. General Manager, July 1935.
- 47701 Conglomerate at base of Hanbury slate, Penn Mine, Menominee iron range, Michigan. Collected by Stephen Royce, April 1936. (see his letter of April 21, 1936 to C. K. Leith, filed under Penn Mine).
- 47702 Gold ore from shear zone in Keewatin, from the shaft of Hollinger Cons. Gold Mines, Ltd., on the Smith-Thorne gold claims, near Horwood Lake, District of Sudbury, Ontario. Presented by Geo. A. Thorne, Jr., April 1936.
- 47703 Gold-bearing rock from shear zone in Keewatin on the north side of Newton Township (south-west of Horwood Lake), District of Sudbury, Ontario, discovered by Hollinger Cons. Gold Mines, Ltd., fall of 1936. Collected by C. K. Leith, September 1936.

- 47704 Typical scarn ore from central Sweden. Col-
lected in August 1936 by C. K. Leith, in com-
pany with Dr. Per Geijer.
- 47705 Sheared sediments along Caledonian thrust planes
47706 near Abisko in northern Sweden. Collected in
August 1936 by C. K. Leith, in company with
Dr. H. A. Brouwer.

