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Cloquet, Minn, and vicinity, survey of lands of Cloquet Lumber Co. [with C.A. Cheney, Jr.]. No. 464 July 1914

Leith, C. K. (Charles Kenneth), 1875-1956
[s.l.]: [s.n.], July 1914

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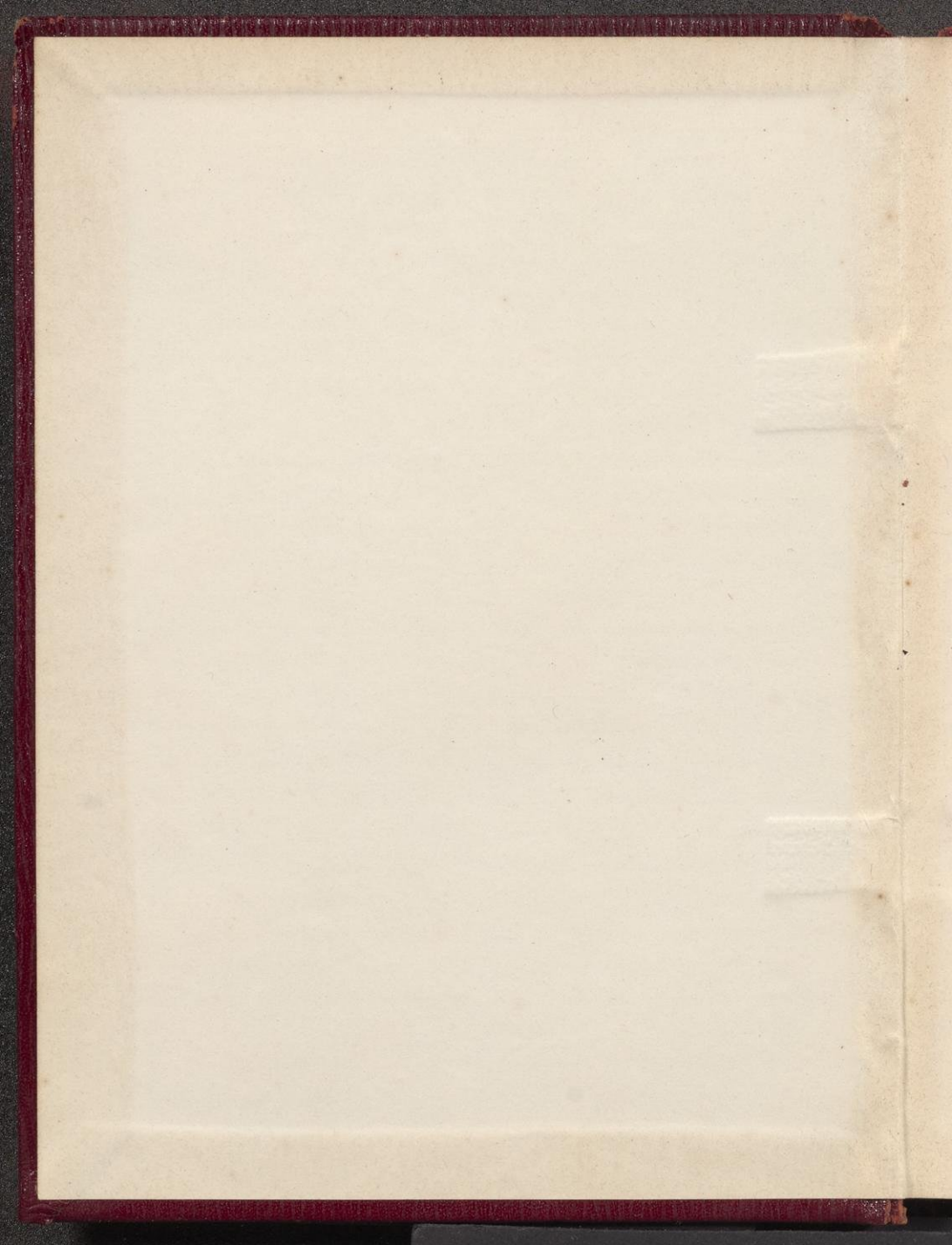
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FIELD SECTION BOOK



Notebook #464.

Cloquet, Minn., and vicinity
(with C. A. Cheney, Jr.)

Notes by C. K. Leith,
July 1914.

Survey of lands of Cloquet
Lumber Co.

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Notes on Cloquet, Minnesota and
Vicinity, July 22, 23, 24, and 25,
1914, with Cheney.

C. K. Leith.

Examined outcrops near Cloquet; also on two roads to Carlton, east and northeast of Carlton, southeast to Wrenshall, southwest to Barnum. The essential facts noted are as follows:

1. A series of drag folds with axes striking about east and west.

2. East pitch shown by a few direct observations in the vicinity of Carlton and Cloquet (See map), by the general eastward slope of the ridges, by the southeastwardly trend of the cleavage on the southern limbs of the fold, and an occasional northwesterly strike of the cleavage on the northern limbs.

3. Folds are slightly overturned by thrusts from the south as is shown by southerly dipping cleavage to the south of Carlton, and dominance of southerly dip of cleavage to the north of Carlton, although vertical cleavage is not uncommon especially to the north of Carlton.

4. Possibilities of thrusts from the southwest rather than from the south as shown

by the dominant relation of cleavage to bedding.

5. Pitches of the folds are so flat that the trace of any bed at the surface is that of a much elongated fold. This can be shown exactly by mapping from the cross section.

6. If the compression is directly up and over from the south then the beds showing at Cloquet will be repeated directly southward. If the overthrust is from the southwest then the beds will work southward and beds higher stratigraphically will appear in the vicinity of Carlton as compared with those at Cloquet.

7. At Barnum and southward the beds become so micaceous and crystalline that clear traces of original bedding are lost. Even the quartz veins are broken into lens shape masses. The dip of this schistosity is low to the south. At some places it is apparently parallel to the bedding. It was obviously regarded as bedding by Hall in his description. This means clearly an overthrust from the south and probably close compression of folds which would tend to make the beds more or less parallel to the cleavage.

8. The cause of deformation is probably the granitic intrusives to the southwest,

possibly also the general Keweenawin folding. As the main synclinal axis of Keweenawin folding is south this would tend to overthrust the Huronian beds from the south, and therefore accomplish the same results as the granitic intrusives. Probably the major effect is by the granitic intrusives because the plain Keweenawin folding would be likely to produce only a straight tilting as it does in the Gogebic and Mesabi districts.

9. Nothing decisive is found to show whether the series works stratigraphically up or down going south. The anticlinal axes north of Cloquet and north of Carlton and in the area between seem to be more marked by graywacke than by slate, and this may repeat one and the same bed. If, however, the trend of the beds is southwestward as would be the case if the thrust came from that direction, then in going south stratigraphically higher beds should be exposed. In either case, stratigraphically lower beds should appear to the west or northwest because the pitch of the folds is easterly.

10. The question then is whether the iron formation beds are above or below the graywackes and slates of the Carlton-Cloquet area. So far as I can see there is nothing decisive on this point. The parallel of the Michigan slates suggests that the iron formation is below, in which case any possible iron formation will be found to the north and west of Clo-

quet. If the iron formation should be above the Carlton-Cloquet group they should appear either south or southeast of Carlton and Cloquet, and there is little room for them here between the slates and the Keweenawin fault. Also to the south the metamorphism by the granite would cut off possibility of iron ore. Therefore, the only possibility for iron formation seems to be north and west of Cloquet.

