Notes on the geological structure around Crystal Falls Mich., lower 43N 31+32W. No. 285 [1891?]

Matthews, E.B.
[s.l.]: [s.n.], [1891?]

285

285

LAKE SUPERIOR SURVEY

NOTES

LAKE SUPERIOR SURVEY.

INSTRUCTIONS.

Topography.—On the left-hand page map as much of the section as has actually been seen, counting each of the spaces between the blue lines as 100 paces, and 20 of these spaces to one mile, or 2,000 paces. The scale is four inches to the mile, and the heavier blue lines, outlining one inch squares, mark forties. Denote streams, lakes, swamps, marshes, etc., by the topographical signs annexed.

The geologist will consult with the compassman, and describe as accurately as possible, the timber traversed. When pine is found, give its proportion; tell whether good or poor, and indicate kind—white, norway, jack. If hemlock is found, note the relative amount. In hard wood districts, designate as good or poor, heavy or light, and indicate predominant kinds, oak, maple, birch, etc. Cedar swamps, spruce swamps, tamarack swamps and meadow swamps will be always discriminated. Outline burnt timber.

Each day, just before leaving camp, the geologist will compare his own and the camp aneroids, and the reading of each, with time, will be recorded. At work the aneroid will be read on gentle slopes at intervals of 200 paces; on steeper slopes at intervals of 100 paces; also at all maxima and minima. When minima are streams the map and notes will indicate this, showing width and character of streams. When a stream has made a cut of importance, aneroid readings will be made where the banks break off and at water level. If instead of an abrupt break, the stream valley has steep slopes, aneroid readings will be made with sufficient frequency to show this character.

At reading points the compassman will stop, read the dial compass, and remain until the records are complete. The readings will, as fast as made, be placed upon the map at the right-hand side of the line traveled, and in the notes, the numbers being inclosed in parentheses, basing the work upon the bench-mark which served as a starting point. At bench-marks the absolute reading of the aneroid and the altitude as shown by the bench-mark will be recorded to serve as a base for subsequent readings. For instance, aneroid 29.13 inches; altitude on bench- mark, 275 feet. At each subsequent reading, by setting 275 on the altitude circle at 29.13 on the fixed dial, altitudes may be directly recorded. When the next bench-mark is found at two miles distance, the difference between the aneroid reading on the basis of the first bench-mark and the second bench-mark will be recorded. At intervals of a half hour during the day the time will be attached to the aneroid readings. Upon reaching camp, after the day's work, the geologist will record the readings of his own and the camp aneroid, and also the time. Interpolations will then be made, based upon the bench-marks and times (not distances) if the day has been one of no abnormal atmospheric disturbances, or upon both bench-marks and camp aneroid readings if there have been unusual disturbances, and the corrected numbers, less a constant of 4 feet, will be placed upon the face of the map at the left-hand side of the lines of travel, and in the notes without parentheses, but the parentheses numbers will not be erased.

At each aneroid reading the trend of a horizontal contour line will be indicated upon the face of the map, making the length of the line correspond as nearly as may be with the actual distance seen. In passing directly up or down a slope, the contour lines will be at right angles to the direction of travel. In passing up a hill diagonally the contour lines will intersect the lines of travel at various angles, which can be estimated and plotted with sufficient accuracy by an appreciation of the north and south direction.

The course of travel will be always north and south. In starting from a quarter or a sixteenth post, the work will be plotted on the assumption that the true course is followed, but upon reaching the next section line the geologist will remain in the position at which the line is struck by the compassman until the latter finds the adjacent bench-mark. The intervening distance will then be paced by the compassman, and the point of intersection of the section line marked. From this point to the starting-point, a right line will be drawn as the actual course of travel. The positions of the contour lines, aneroid readings, etc., will not be changed.

Geology. — In running the north and south lines, the compassman will, if possible, determine the course by the dial compass. At the time the geologist reads his aneroid, the compassman will determine the magnetic variation, which will be given to the geologist and recorded in the note-book. Each morning the watch of the compassman will be set to apparent time (corrections being made for the equation of time and for longitude), so that he will need to make no correction in reading magnetic variation. On cloudy days, and at times when the sun is too low for the use of the dial compass, the course run will be by needle upon the supposition that the magnetic variations indicated on the township plats are right when corrected by deducting 3° if the variation is east, or by adding the same amount if the variation is west.

Not less than once per week the accuracy of the watch of the geologist in charge of a party (who will give time each morning to the compassmen), will be tested. This may be done, first, by obtaining correct time from a railway station by means of a packer when sent out for provisions. Such time will be mean, i. e., watch time for the nintieth meridian. Second, corrected time may be found by blazing out a north and south section line, preferably a range line, for some distance, setting a signal on the line and placing the dial compass duly leveled, in a north and south direction upon a Jacob's-staff just before mid-day, and setting the watch at 12 at the time the line strikes the noon hour. In a watch thus set all corrections are made.

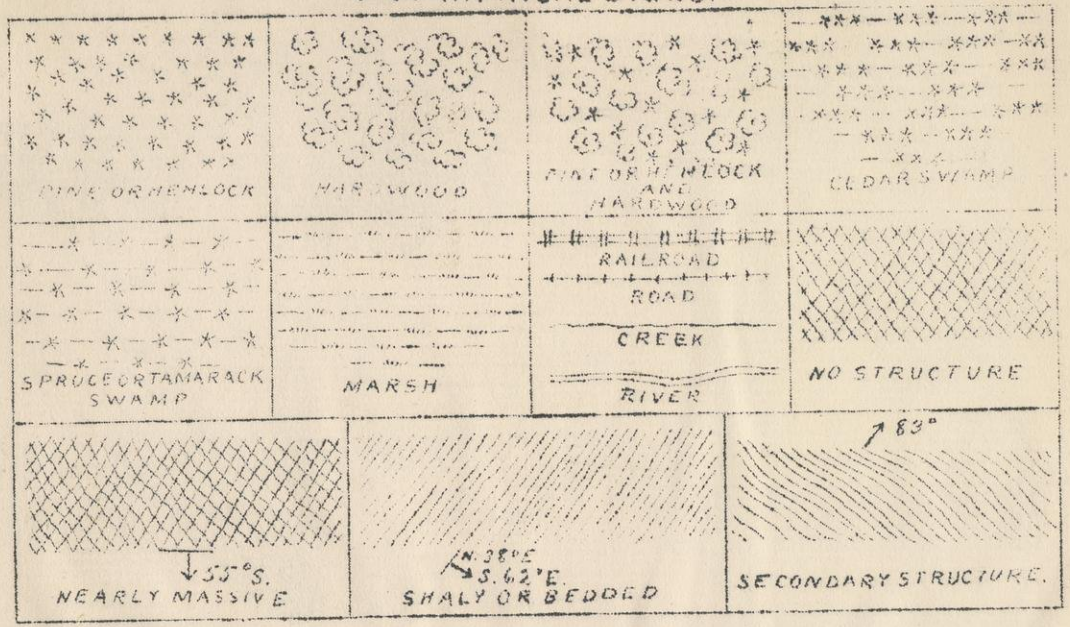
It will be the constant business of the geologist to search for outcrops. All hills within a reasonable distance of the course of travel will be examined. Oftentimes upon the steeper slopes of a hill a rock surface is covered with a coating a few inches thick of moss, leaves or vegetable mold and can be stripped with the pick. Where the exposure is small and there is the least possibility that it may be a large bowlder, indicate this fact in the notes and by a query on the map. All ledges off the line of travel of the compassman will be located by the geologist pacing to this line in an east and west direction, his course being determined by compass.

Denote the ledges of rock, when no structure is made out, by cross-hatching, making the cross-hatching cover as nearly as possible the areas occupied by the exposures. If the rock is a massive one, but still more or less plainly bedded, use the same sign with a dip arrow and number attached, showing the direction and amount of the dip. Denote a shaly or other very plainly bedded ledge by right parallel lines, and a ledge having a secondary structure by wavy parallel lines running in the direction of the strike, having strike line and dip arrow with numbers attached. The greatest care must be taken to avoid confusing slaty or schistose structure, with bedding, and in all cases where there is the least doubt about the true bedding direction, indicate it by a query.

To each exposure on the face of the map, attach the number of the specimens representing it. On the right hand page place the notes descriptive of the exposures. Begin in each case with the number of the specimen, placing the number on the left hand side of the red line, after which give in order on the right of the same red line, the position of the ledges as reckoned in paces from the southeast corner of the section, and the dip and strike when observable, for instance, *No.* 437, 1226, *N.*, 353 *W.*, *Strike*, *N.* 47° *E.*, *Dip*, 68° *S. E.* Then follow with as full a description of the ledge as possible.

Collect a specimen from every ledge, and if the ledge exposes different kinds of rock, collect a specimen of all varieties. Take care to get fresh material, unless for a special purpose the weathered surface is desired. Where ledges are infrequent the normal size of specimens will be 3x4x1 inch. In case several specimens of the same ledge are necessary, and when ledges are numerous, specimens 2x2½x¾ inch will be allowed. In all cases collect chips for slicing. No two specimens will be given the same number. In the cases in which several specimens come from the same ledge, the different numbers assigned to them will enable an easy description of their relations. Specimens will be placed at once in paper bags provided, upon which shall be marked in at least two places, with a blue or red pencil, the specimen number.

TOPOGRAPHICAL SIGNS.



EQUATION OF TIME FOR 1891.

Day	Min.	Day	Min.	Day	Min.
		JUNE.			
		Add to watch time.			
1-6	2	7-11	1	12-16	0
		Subtract from watch time.			
17-21	1	22-26	2	27-31	3
		JULY.			
		Subtract from watch time.			
1-6	4	7-13	5	14-31	6
		AUGUST.			
		Subtract from watch time.			
1- 7	6	8-13	5	14-18	4
19-23	3	24-26	2	27-29	1
30-31	0				

Book 285

SEPTEMBER.

Add to watch time.

1- 2	0	3- 5	1	6- 8	2
9-11	3	12-14	4	15-17	5
18-19	6	20-22	7	23-25	8
26-28	9	29-30	10		

OCTOBER.

Add to watch time.

1	10	2- 4	11	5- 8	12
9-12	13	13-16	14	17-22	15
23-31	16				

NOVEMBER.

Add to watch time.

1-13	16	14-19	15	20-23	14
24-26	13	27-29	12	30	11

Notebook. # 10.
E. B. Mathews.

The results given in this book and on the accompanying map were reached for the most part by Mr J. R. Finlay and myself. By us simply because the phenomena happened to lie in the territory allotted us. The work of the purely Precambrian area was just as carefully done though with less striking results.

The stratigraphical conceptions represented herein are more due to Mr. Finlay than to myself. Both of us worked together + apart and he had had the more stratigraphical experience.

E. B. Mathews.

Blank Even Pages

2-22

Skipped

Notes on the geological structure around Crystal Falls Mich.
Towns 43 N 31 + 32 W.

ore horizons

In general there seem to be two different horizons in which the ore formation may be found; & one or the other of which is frequently wanting in a cross-section of the formation.
For convenience they may be designated the upper and lower ore horizons. The one - a bessemer - represented by the Mansfield, Hollister and Hemlock mines for the lower while the Crystal Falls, Great Western Lincoln, Paint River, Monitor, Youngstown, Claire, and probably the Shaffer & Dunn, Mines represent the upper or non-bessemer ore.

The most characteristic mine of the lower formation is the Mansfield (for full particulars see Fuller #1) which is situated in a long fold whose axis

lies north and south along the western portions of sec. 20-17-18 (43-31) l.c. along the Michigamme River, with its termination ("nose") to the north in the SW of SW of 8 (43-31)

The ore formation here lies next to a very thin band of red and black slates. The red slates are not distinguished by a sharp line of demarkation from the greenstones but rather pass into them through a mixture of greenstone and red slates.

The ore body here is plunging north at a steep angle.

This lower ore horizon, as will have been noticed is but a few feet from the greenstone. Such also is the case at the Hollister & Hemlock mines. Whether the Mansfield fold connects, as is suggested, with the Hollister mine I am unable to say. Possible the desired data may be gained from the survey

of sections 29 + 30. This I know there is a sufficient band of swamp without greenstone to allow the fulfilment of the conjection. Further throughout the greater part of secs 13 + 24 the variations are strong and variable. [we could not work them up on acc't of cloudy weather]

Throughout secs. 17-18-19-20-6-7 and parts of 5-8 (40-31) there is a wonderful display of every (?) variety of greenstones, + banded, agglomerate, breccia, amygdaloidal + massive

The mansfield fold is the most easterly point at which we were sure of the iron formation, except, of course, Michigamme Mt. We found, however, a series of test pits and a line of changing variations were found as indicated on the map.

The variations seemed to lose their variability as they approached

the N+S center line of sec 10.

Whether or not it represents an ore formation which extends to the Michigamme Mt. (as has been suggested) we cannot say for the data on which to base a sound judgement is wanting.

Black slates appear in the test pits in 16-15-21-22 but no ore of acc't if any at all.

Of Michigamme Mt I am not well enough posted to write, I think Brooks + Sanford found the time allotted too short to accomplish what they wished at this point

This was also the case with the series of test pits represented in sec 6 (43-31)

Passing now to the westward we come upon the Armenia Mine in the NE of the SE of 7 T 3 (43-32) Here the ore formation (upp) is surrounded on either side by a thick stratum of black slates which have a general strike about S.W.

The connection between the Armenia Mine & the Great Western, Lincoln etc is purely hypothetical. It would seem probable that the upper ore formation does extend from the Armenia (as sketched) through the Lee Reck & Hope Mines to the Great Western etc Mines.

Continuing to the Paint River we find what appears to be a solution of the rest of the problem. Following the river in its SE course from some point just north of the R.R. Bridge we find the

follow succession

a. a.- The top of a stratum or bed of black slates dipping very steeply to the south and striking almost E & W.

b. Next above these (downward) is a band of highly siliceous rock which, through the immense dynamic movement the region has here undergone, has become exceedingly brecciated & later recemented into a marked and characteristic pseudo-conglomerate or breccia.

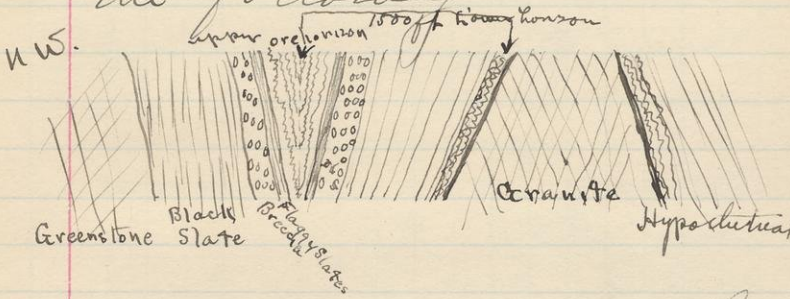
c. Between this breccia and the ore formation comes a narrow band of flaggy slates 75-100 feet thick.

d. Above this is the much contorted and plicated iron formation which seems to be the bottom of a deep syncline.

Continuing southward we find the reverse repetition of the same beds until the last thick bed of black slate

passes into or is replaced by the red slates which lie adjoining the granites.

The above succession would then give a NW + SE section parallel to the river about like the following



In all cases the upper ore horizon lies between 1/2 + 1/4 miles distant from the greenstone or granite.

According to our hypothesis it is fairly probable that an ore formation might be present between the slates + greenstone and also (as represented) between the slates and the granite.

In this whole hypothesis the granite and the greenstone have been considered as equivalents.

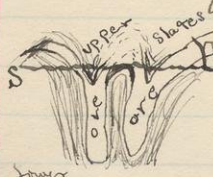
(I have in my possession three specimens supposed in the field to be:— a.- the contact between black slate and a very much decomposed rock thought to have been orginally granite. b.— a specimen of what in the field was thought to be an intermediate stage of decomposition & c.— a specimen of the granitic rock. Later examination (not mine only) leads me to look with doubt on the validity of the field hypothesis. I think, however, that a contact specimen could be found by a more thorough search.)

Across the river from the outcropping of granite is an "exploration" called the Way Mine which is supposed near the granite to be in the lower ore horizon. Lack of time & snow storm prevented our visiting it.

To return to the East + west portion of the upper ore horizon [outcropping in sec 20 + 21 (43-32)], between the east section and east eighth line of sec 20 occurs a knob of slate laid bare by a R. R. cutting.

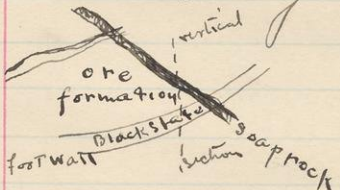
This is shown in my notebook #9 to be a very greatly crumpled, shattered + minutely pleated mass of black slates which according to our hypothesis would lie above the ore formation.

It seems quite probable that the ore formation somewhere just East of the Great Western Mine becomes instead of a simple synclinc a double one with a N + S section somthing like the following.

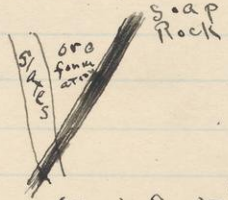


Furthermore the evidence seems to point to the fact that the north leg of the syncline pinches out, so far as the iron formation is concerned, somewhere in the SW ¼ of 15. thus allowing the slates above and below the iron formation to lie over each other & to form a shallow syncline in the greenstone.

In the Paint River Mine there is what appears to be a dyke of green "soap rock" extending something like this.



Horizontal Section



vertical Section.

(These sections are not in proper scale but will show the general idea of the local formation.

The situation of this soap rock gives rise to the very strong

probability that the ore body is pinched out on the east by the dyke and that it will soon be pinched out at the bottom by the same walls owing to the steep dip of the dyke.

The Shaffer and Dunn mines were studied so hastily that no clear conception worthy of report could be gained. However, nothing was found which presented a negation to the validity of our conception.

The north third of 43 R 3 W was found to be a vast greenstone area as is roughly represented on the map.

Sec 18-7-6 in their western portions were originally pine plains formed by the drift materials.