FIELD NOTEBOOK - DIARIES

of

CARL LUDWEG ROMINGER, STATE GEOLOGIST

1871 - 1874

Transcribed by Mrs. Margaret Reilly.
The original notebooks are deposited
in the Historical Collections, University
of Michigan.

I. Rominger Exploration 1871, Northern part of Lower Peninsula

II. " " 1871, Upper Peninsula

III. Expense Account for 1871

IV. Rominger Exploration 1872, U. P. by way of Wisconsin

V. " Memorandum 1872, Depth of Wells etc.

VI. " Exploration 1873, Central part of Lower Peninsula

VII. " 1873 Environs of Saginaw Bay, Hillsdale and Branch Co

VIII. " Trip to Cleveland and Vicinity, 1873

IX. Expense account for 1873, additional notes, Fossils of Europe

X. Rominger Exploration, 1874 Alpena across interior to Traverse Bay.

XI. " " 1874, Salt Wells around Saginaw

XII. Fossils of Rock layers westerly from LeOnce

XIII. Catalogue of Star Corals, prepared March 1874

Diary from May 2, 1871

Front cover note. 1 chain 66 feet.

Mai 2, 1871. At noon left Detroit on lighthouse steamer on invitation of Mr. Lederle, assistant of the lighthouse superintendent.

Arrived at Port Huron May 3, at noon. Weather stormy preventing us from running into Lake Huron until Friday May 5. Weather still very windy after having advanced about 15 miles. Beyond Forestville we had to turn back and could only proceed northwards again Saturday May 6. At noon that day opposite Pt. of Barques, 9 P.M opposite Sturgeon point lighthouse. Sunday Morning 6 o'clock arrival at Presque Isle.

Has a spacious port with about 15 feet of water. The spur on which both lighthouses are situated has an elevation of about 20 feet. Consists superficially of limestone pebbles with a few boulders of granite and diorites. The limestone pebbles are principally derived from the underlying rock which scarcely anywhere crops out, except in times of low water at some points of the beach; but everywhere about 3 feet under the detritus the rock beds are found. They belong to the corniferous limestone, are of light grey colored irregular uneven bedding full of earthy-looking feint(flint) nodules of crystalline texture containing some fossils partially silicified. The principal fossils found are: Syringopora Hisingeri, Michelinia convexa, several species of Favosites (Alveolites, thin laminae with small tubules), cladopora labiosa and signs of other species, Phillipsastrea Verneuillia, Eridophyllum Simcoense, Clysiophyllum Oneidaense, Cyathophyllum indistinct, Stromatopora textilis, Atrypa reticularis, Spirigera concentrica of the variety which is common at Ohio Falls, Spirifer gregarius, Spirifer gregarius, Spirifer similar to mucronatus with higher area(areci).
No. of locality I, specimens labeled accordingly.

On the low ground behind the pebbly circumvallation of the beach there is a very delicate Primula ? with rose colored flowers in bloom. The soil of the land spur and its timber which is principally spruce & pine, arbor vitae and small white pine with some birch and asp(en) tree intermingled are entirely worthless.

Also the whole land encircling the bay is of a similar character and almost unfit for agricultural purposes on account of its pebbly character or the lower portions of it by their swampy condition. Wood is only fit as fuel material.

Monday May 8. Our departure is delayed by the shipping of some material to be removed from the old lighthouse which is wholly abandoned. At 1½ P.M. we leave harbor at 11 P.M. we arrive at Scammons Harbor on Williams Island, one of the Cheneaux Islands. The water between most of these islands is deep enough for large vessels.

Tuesday May 9. I visited besides Williams Island, Isle Isadore and Isle Richard and circumnavigated part of St. Louis Island.

All of them are scarcely elevated more than 25 or 30' above the water, are densely covered by spruce pine, arbor vitae, some tamarack, birch and few maples, but none of large size. The soil is too rocky for cultivation.

No rock ledges are seen on any of these Islands. They are composed of boulders of various dimensions, almost exclusively derived from the dolomitic strata of the Niagara group, with few dioritic and granitic blocks, the Niagara boulders intermingled.

Contain some very poorly preserved partly silicified specimens of the ordinary Niagara fossils, Favosites favosa indistinct Catenipora, Syringopora, Alveolites and casts of Pentamerus.

From the seaside all the other islands not mentioned as Ile LaSalle, Boot Island, Bootjack Island, Strongs Island, Ile o'Cochons have the same character as those mentioned. Neither their timber nor their soil is of practical value.

In the afternoon I sailed round Boot Island, Bootjack Island and found all consisting superficially of the same calcareous drift material.

Wednesday the 10. I investigated the shore of Strongs Island and the land spur west of it stretching in the same northwesterly direction then I entered the creek running northwards at the head of the bay in Township 42, Range 1. The water of the creek has a peculiarly red color but is perfectly clear. About two miles above its mouth it runs over ledges of a massive dolomitic limestone in big blocks. They belong to the Niagara group. Contain apparently no fossils; by atmospherical decomposition they weather into a white dolomite sand.

Further up the creek which I followed up three miles further, the land rises only little and spreads out in a somewhat marshy level without any exposures of rock. The trees are generally of the same character as mentioned on the different islands but there are also white pine threes(trees) of good size, some of them 3 and 4 feet in diameter but not abundant. The rock ledges and dolomitic sand have the locality No. 2. The rise of the land along the mentioned creek is probably not more than 50 feet. Along the creek are numerous trees felled by beaver.

Thursday May 11. Departure from Williams Island to Mackinaw at 1½ P.M. 5 o'clock arrival at Mackinaw. At 6 left for Pine River, morning.

Friday 12. 8 O'clock at Pine River. Took possession of the boat. Paid 10 dollars charges on it and left for Manitou. Arrived at 5½ P.M.

The island is about 200 feet elevated above the level of the lake and consists principally of an accumulation of alternating layers of calcareous pebbles and sand.

On the southeast side thereis an exposure of about 20 feet. Above is gravel about 3 feet thick, then follows sand from 8 to 10 feet, below is a stratum of hardened clay of reddish gray color from 3 to 4 feet thick, in some places all fine and homogeneous, in other places intermingled with pebbles, under it is a fine seam of pebbles and then again sand 10 to 12 feet thick. The shore is with few exceptions where it is sandy all lined with pebbles principally calcareous with few granitic and dioritic rocks.

Saturday 13. Went through the island to the south side of the island. Its soil is all sandy, in places susceptible of agricultural cultivation. On the east side the land is lower surrounding a spacious bay on which the lighthouse stands. Principal character of the woods near shore evergreens. On the south side and over all the elevated portions of the island are extensive maple growths with some beach trees intermingled. The south side forms a bold bluff about 80 feet high and consists of sand and gravel layers.

A section of it is as follows from below upwards. Bent and distorted argillaceous sand layers having sufficient coherence to form perpendicular bluffs, beds of gravel are wedge-like interstratified 8 feet.

Diagram.

The shore is all gravelly and extends on the south side a good ways in with shallow water. North Manitou Island has on its south side similar bluffs and seems in all respects to be geologically identical with the south island. Also its forests have the same character.

The whole shoreline on the opposite side of Michigan lake presents from Mission Point lighthouse down to Sleeping Bear Point the same bold escarpments of sandy drift accumulations. The Hills along the coast are about 150 feet high and are densely overgrown with forests of mixed character. Sleeping Bear Point and a few others are on the lake face entirely denuded of vegetation up to the top of the hill.

Sunday May 14. Unloading of the vessels. Monday 15. Continued unloading. Splendid weather.

Tuesday 16. Windy and rainy. Unable to finish unloading. In a pebble on the beach found a specimen of cyclolites. Probably identical with the one decribed by Hall from the Clinton group. Marked No. 3. At noon the weather clears up. The north side of the island forms similar bluffs as the south side. No where are the older rocks exposed.

From Manitou Island we departed under strong headwind at 7 o'clock P.M. During the night rather unpleasant rolling of our vessel.

Wednesday 17. Morning 7 o'clock passed the lighthouse Schilligance and approached Mackinaw landing at 11 A.M. in fine sunny weather. At Mackinaw I received the maps of the reserved mineral lands. Got some articles for repair of the boat(boot) and started for Scammons harbor at about 2 P.M. we arrived there at about five o'clock.

Thursday 18. Splendid weather . Have to wait for repair of the boat. Excursion along the shore of mainland east of Scammons harbor. Ledges of Niagara limestone crop out all along the land tongue. On the north east side of Strongs Island the limestone forms large rock masses of dolomitic character. Fossils are generally scarce and ill preserved but I found a Syringopora cyathophylloid, Heliolites, Pentamerus oblong crinoid stems, Stromatopora Favosites and some others. Fossils from this locality are marked with No. 4.

This limestone may be employed for rough masonry. It can be quarried at the shore and loaded on rafts which draw about 4 feet. Waters. For larger vessels numerous rocks and reefs are dangerous but by sufficient care they may be avoided. The rock exposures are principally in township 42, range 1 east, Sec. 36 and 35.

Friday 19. Written to the Governor acknowledging the receipt of maps. 4 o'clock in the afternoon left Scammons harbor for Mackinaw. Arrived 6 o'clock.

Saturday 20. Two men taken in employ. One woodsman with 50 dollars per month and one boatsman with 40 dollars per month. The day was spent in fitting up the sails and other deficiencies of the boat. Wind westerly so as to make it impossible to sail in that direction.

A reconnoisance over part of the island shows it composed of two principal teraces (terraces). The lower one consists below of well and regularly stratified argillaceous limestone slabs and shales of pale grey color with numerous calc spar crystals interspersed, above them are massive brecciated limestones composed of angular fragments of rock similar to the slabs below and of a more crystalline purer limestone. Many sparry and silicious veins run through the rock in various directions. Sometimes favosites, cyathophylla, encrinite stems and other fossils are imbedded. The different picturesque rock precipices along the shore are formed by this limestone.

Also the Sugar Loaf hill is belonging to this breccia, the top of which forms a widespread terrace on which an other one rises on which the old fort was once erected.

Silicious brittle whitish strata seem to form the base of it. On those succeed thin bedded irregularly splitting limestones which contain a considerable number of the usual corniferous limestone fossils. But few of them are in good state of preservation. A portion of them I deposited at the foot of the observatory until my return to the place

On the plateau to the right on ascending the wagon road to the new fort there is an outlier of these upper limestones in almost perpendicular position which decidedly is a remainder of the strata which formerly uniformly covered the whole island and was subsequently undermined and washed away by the waters of the drift period or earlier. On top of the island and over the terrace below are strewn a number of granitic boulders.

Sunday 21. Wind does not permit to go out coming from northwest. Went on top of the first terrace on the south side of the island. Brecciated limestones composed of limestones of the most various characters sometimes crystalline brittle, sometimes silicious or argillaceous in places. The breccia contains large cyathophylla or perhaps clysiophyllum and several species of favosites, but for the most part there are no fossils to be seen.

The stratification is not distinctly to be seen. It seems the rock masses are overturned and inclined in the most irregular manner. From there I descended the terrace near a boldly projecting rock mass called Robisons Folly.

This rock is about 100 feet high and consists of a most confused breccia of all sorts of calcareous silicious and argillaceous rocks. In some places there is the horizontal stratification observable, in other places a subsequent dislocation of the semi-plastic mass is quite evident. The upper portions are composed of larger angular fragments of almost purely calcareous character. Below are calcareo-argillaceous very even bedded strata occasionally assuming the form of a slaty rock.

The lower strata down to the waters edge are hidden in that place. Further on, on the east side of the island the brecciated limerock comes down to the waters edge. Under it are very hard even bedded subrhomboidally fracturing argillaceous lime strata which continue to crop out some distance inward to the lake. The(y) are in close connection and alternating with the breccia beds at the same place. And evidently in the same horizon are dark brown carbonaceous clay(ey) limestones containing numerous fossils- Clysiophyllum rugosum, Zridophyllum some Bryazoa and various species of favosites. It is possible that these rocks have fallen down from the top of the escarpment where similar strata are seen. The limestones at the water's edge have the same brecciated character.

The specimens collected are all labeled by paper slips indicating the precise position of each concerned stratum.

In the afternoon I collected rock specimens along the wagon road to the new Fort. In some of the strata is Leperditia alta- tolerable common. On the old Fort hill I made extensive collections of all the fossils I could find. Wind is still contrary, coming from northwest.

Monday May 22. 8 o'clock sailed out from Mackinaw against the wind. About 12 o'clock we arrived in a bay on the opposite mainland about 2 miles north of Ft. St. Ignace. Brecciated limestones entirely equal to the Mackinaw breccias form a few hundred steps back from the shore bold escarpments. One a little more easterly situated has the popular name Rabbits Back. The breccia is in its upper portions fossiliferous and in the drift forming the surface of the plateau are fragmentary strata dispersed which agree perfectly with the limestones forming the highest top of Mackinak Island.

At Point St. Ignace the land descends into a low spur. The shore is formed by calcareous pebbles but on the way to Point le Barbe, a short distance back from the shore frequently the brecciated limestones are exposed in bold rock or in steeply slanting hillsides escarpments. (Probably the word "escarpment" should follow after "bold rock").

Before reaching the creek flowing out of a lake between Pt. LeBarbe and Gros Kape(Gros Cap) the brecciated limestones are freely exposed. On(e) exposure is an isolated columnar rock 50 feet high. Its structure shows plainly that the rock of different superimposed strata was broken up and coarsely mingled and cemented afterwards. There are series of strata of very characteristic rocks preserving their former regular stratification.

Seen in the rock mass holding every imaginable irregular position to the other agglutinated rocks the upper portions contain decided corniferous limestone fossils. The lower portions are in character more allied to the underlying rock of the Waterline group forming argillaceo-dolomitic slabs with very even surface. They crop frequently out in regular position about 10 feet above the waters edge and form there a low terrace on which rests the brecciated limestone.

Diagram of above.

On top of it and almost insensibly merging into it are the not brecciated impure corniferous limestones with an abundance of fossils but these strata are not found in regular position. They have evidently participated in the disturbance which formed the breccia and the fossils in it and the breccia are perfectly alike.

Over and above all are spread out more or less considerable drift deposits. We followed the shore into the bay this side of Cross Cape where we made camp for the night. The breccia escarpments continue some hundred yards backwards from the shore up to Cross Cape.

Tuesday May 23. Walked along the first terrace up to Mr. Blanchard's farm. There one a road cut along the hillside a complex of about 60 feet of strata are exposed in regular superposition. They are numbered 1 to 5, 1 being the uppermost layer in character. They correspond entirely with the lower strata exposed at Mackinak and with those exposed on the lower terrace.

As an actual continuation of Pt. aux Chenes the brecciated limestones set in the top of which is fossiliferous and mergos in the argillaceous not brecciated limestones forming the summit of Mackinac. Several boldly projecting rock masses and isolated pillars are observable along the line. The second terrace is fully 100 feet high in some places.

Arriving at the bay of Little Point aux Chenes the high rocky bluffs recede and the land on the opposite shore of the bay is all low land overgrown with fine fuel timber. Its soil seems to be quite productive as well as the soil on top of the rock escarpments which are most under tillage.

On the other side of the creek, opening in the Little Pt. aux Chenes bay and taking its source from an inland lake there was a number of quarries opened for gypsum which is intercalated between similar rocks as those of a little higher horizon. Under the breccia limestone generally a bluish gray and reddish clay or marl surrounds the irregular threadlike or nodular masses of gypsum. A similar clay appears cropping out in the lake bed in several locations from Pt. Ignace to Pt. aux Chenes. At Blanchards farm in close proximity with these clayi(clayey) strata, big rock beds are seen in the bottom of the lake. The gypsum is probably underlying the whole district wherever the brecciated limestones are exposed and by boring very few yards the gypsum could be reached.

Point aux Chenes is a sand hill and all along the shore sand hills forming high precipitous bluffs along the lake are noticed.

Up to Manitou Laymont fishery where I made the second encampment after a hard day's work of boat pulling against the wind with shore lines.

The sand hills are all well timbered but no valuable pine wood. On top are beech and maple. The shore is for the most part sandy but further in the lake the bottom is generally very rocky, partly consisting of granitic boulders and as it appears of Niagara limestone in loose blocks.

Wednesday 24. Started with good wind at 6 o'clock in the morning. Arrived at Point Epouffete at 7 o'clock. The sand hills recede from the shore near the bay and Point Epouffete which latter exposes the naked rock beds of the Niagara limestone filled with the characteristic fossils but in very bad preservation. The rock is dolomitic. Would answer for rough masonry but is by no means a building stone of good quality.

All round the bay the beds of the Niagara limestone crop out on a level with the water. The whole is low land. Further on the ground rises again a little but only sandy beaches and seldom rock is to be seen. On the rock bed of Pt. Epouffete I found the name Winchel engraved.

From Blanchards place there is no farm to be seen. Only fishing stations line the shore at distances. The land is well timbered by a mixed growth of evergreens and deciduous trees, but near the shore and some miles back from it, is not much valuable pine wood.

At 8 o'clock we left the Point and sailed on to Mille Coquins passing Bid(d)les Point. All the land passed is low and sandy near the shore. At Mille Coquins the rocks of the Niagara group with many fossils are to near the surface but a good open exposure is not seen. The whole surface is covered by large angular blocks and by waterworn pebbles of a crystalline light-colored limestone with silicified fossils in poor preservation. Among others I observed Stromatopora, Syringopora, several Favosites, Pentamerus, Stromboides pentagonus, catenipora. The limestones do not extend further up than the mouth of the river which runs over the low ground in a sandy bed. The specimens from Epouffetes are marked with 5. Those from Mille Coquins with 6.

Thursday 25 May. At 4 ant. Merid. appearance of a fine day. 5 o' clock rain with contrary wind. Made an excursion up to the Mille Coquins lake about a mile back from shore. The land is low swampy, covered with gravelly fragments of Niagara limestone and few granitic and dioritic boulders intermingled and with large rock pieces of Niagara limestone which are little worn. Above those a sand terrace of from 50 to a 100 feet high rises abruptly. The sand contains scarcely any limestone fragments but on top of the terrace are big rock masses of Niagara limestone dispersed. The sand contains argillaceous parts and bears a fine hardwood timber, beech, maple, birch with very few pine trees.

The top of the terrace is not a dead level but in contrary very much undulated by sand hills. Further back from the shore the sand looses its argillaceous parts and the woods are exclusively pine woods which are quite open and allow a open survey of the country in consequence of former fires burning up all the fallen trees and underbrush.

The lake is a fine large lake situated considerably higher than the river. Its shores are only 3 or 4 feet elevated. Some deciduous trees mix in around its shore. The outlet of it curves a deep channel through the sand hills and has its bed at the great curvature. Towards the east 50 feet below the precipitous sand margins the water rushes there with considerable velocity over rock pieces of the Niagara group intermingled with ordinary waterworn drift material. But I could not see any actual ledges. Further on the bed is sandy and soon enters the low lands which continue to its mouth.

In the afternoon at 3 o'clock I sailed out towards Point Patterson but after we had made about 4 miles the wind got contrary and a dense fog came over us. So we turned back and with great trouble and danger we finally succeeded in passing the strong breakers before the river where we lay now in safety.

Friday May 26. Early in the morning foggy. At 6 o'clock clearing up. Not much wind. At seven o'clock going out again, weather now sunny, lake quiet. After sailing about 5 miles in 3 hours suddenly a contrary wind and turbulent sea sprang up so that we had to run in for shelter in a fisher hut at the shore in Township 42, range 10, Sec.3.

The shore all the way up is very shoal and even for our boat not approachable. Generally sandy but in some places huge boulders of Niagara limestone are strewn on the waters edge and some distance lake inwards.

The adjoining land is low, sandy, overgrown with Pine timber of stunted poor quality. A few creeks run into the lakw but their mouths are almost perfectly closed by the beach sand. Higher up they have a rapid descent over large limestone fragments and pebbles, all Niagara limestone but nowhere regular strata are cropping out. About 4 o'clock the wind subsided entirely.

Very remarkable was to me to find in the sand arenaceous geodelike masses of the form of an ordinary fungus growing out of rotten timber. By closer examination I found these sandstone-like masses actually to be fungus growing out of some wood branches buried in the sand .While the fungus was growing in the same measure all the porous spaces filled out with sand.

Saturday 27,May. At 3½ A.M. we sailed with good wind from fishery Town 42, Range 10 W. Sec. 8. Passed Point Patterson which is a low gravelly projection and went on to Pt. Seul Choix where we arrived 9 A.M. All the land along the shore is low with sandy banks, only a few large boulders strewn around some of the points.

At Pt. Seul Choix at once the ledges of the Niagara limestone crop out around the whole land tongue. The ledges have a northeast strike and fall in southeast with a low angle of inclination. About 20 feet in all are exposed, the highest strata forming a barrier in the lake behind another one and a thirrd forming a slanting surface on the shore. Fossils are in the uppermost massive strata scarce and indistinct. The middle and lower strata are more rugged uplifting in rough slabs and contain many of the usual Niagara fossils but none well preserved. The specimens from this place are numbered 7. Backwards from the shore all is covered by sand.

exposures

At 12 o'clock ready for departure. The rock continues about 1 mile and ½, then all the shore is again surrounded by sand bluffs until Manistique river. We sailed there by good wind in 3 hours. Manistique River is of considerable size. There is a large saw mill establishment. A ½ mile east from the saw mill is an elevation formed by a limestone ridge marked on the township plate as Limestone 60 feet. The summit of the elevation may possibly be 60 feet over the lake, but the exposure is only about 6 feet. On top about 2 feet of a white weathering limestone of dry earthy aspect, but in a fresh fracture somewhat compact crystalline. It has the appearance of being brecciated. In it are Rhynchonella, encrinite stems, Bryazoa, Terebratula reticularis.

Under it comes a course granular crystalline somewhat soft darker colored limestone with many flint nodules and a number of silicified fossils - Heliolites, Strombodes pentagon, catenipora,Favosites,Syringopora, stromatopora but not well preserved, rare cyathophylloid, one ft.

Under this is a bed almost entirely composed of brittle flint visible ½ foot.

The lower strata are hidden but there is a descent of about 15 or 20 feet when further on a crystalline coarse grained rugged slaty(slaby limestone lays on the surface which contains about the same fossils as the one above the flint but in a still poorer condition. This limestone ridge is said to continue 6 or 8 miles inland and also to the eastward some distance back from the shoreline. Camped on the west side of the river.

Sunday 28. At six we started in northwesterly direction crossing Secs. 12 and 2 in the diagonal line to the big bend of the creek where the water rushes with velocity over flat ledges of Niagara limestone. The land is all a low swamp with inferior pine and tamarack timber. We followed up the creek to its mouth into the lake and crossed it on logs. The shore of the lake in Sec. 34 is sand in the southern side of the creek. On the northern side the cape-like projection on which several ruins of houses stand is composed of limestone ledges, and the elevation is about 12 to 15 feet above the water. A fine strong spring rushes out of the rocks.

Below at the mill dam the ledges of Niagara limestone are finely exposed. The lower strata contain a number of pentamerus and stromatopora. The upper strata are a kind of argillaceous with smooth ledges and a number of fucoid impressions on the surface.

The east side of Manistique or properly called Indian Lake up to about 1 mile this side Smith's creek which enters the northern end is an outcrop of Niagara limestone. It is high land about 15 to 30 feet above the lake and overgrown with fine beech and maple trees. A mile before reaching Indian Creek the land suddenly becomes low, a regular cedar swamp with some large hemlocks and a few white pines. In the more elevated portions the shore is sandy. And the land along the creek which we followed for about 3 miles is an almost impenetrable swamp. The swamp is only in a few places exhibiting some iron colored sand. All the rest is white sand under the black vegetable crust.

On the west side of the Indian Lake there enters the principal stream, Indian Creek, into the lake. Up along this stream some lumbering is done. The most part of the immediate surroundings of the lake is leaf timber, and little elevated land. In the direction of Indian River there is a higher hill seen in the background which seems also to be leaf wood timber.

The road up to Indian Lake leads through wet swamp land which one can only cross by walking on rails. I made arrangements with the managers of the saw mill to carry our baggage up the river until the obstructions by sawlogs are overcome and from there to continue the travel by a canoe up the branches of Manistique River. No. 8. sind die(are the) specimens von(from) mouth of Manistique river. No. 9 Shore of Indian or Manistique lake.

Monday May 29. Left Manistique sawmills transporting our baggage by wagon to the mouth of Indian river into Manistique. Here we took canoe and paddled up the river. Both sides are sandy elevated about 5 or 6 feet. Timber mixed, often pure beach and maple growths; pine is hemlock, balsam and cedar.

About half a mile below the entrance of Indian river there are rapids in the Manistique with rock ledges of the Niagara group exposed. The river us at least 150 feet wide and deep with tolerably rapid current and forming innumerable meanders. Further up the river about ¾ mile above the place where the river takes a northerly direction there are other rapids with the rock ledges of the Niagara group exposed. All along the river is a fine growth of hardwood timber sometimes interrupted by some pine woods.

At the corner where the river makes a southerly turn not far from the entrance of the creek, a dark colored clay with vegetable remains in somewhat hardened banks crops out above water's edge and is covered by about 4 feet of sand. A road runs at the place right along the shore. These clay banks are afterwards seen coming to the surface in several places.

After 4½ o'clock we came to a place where the river bank rises for a short distance to the hight of 50 or 60 feet. The lower 10 or 12 feet are a reddish colored hard clay similar to the one found at Manitou Island. It contains a number of larger and smaller dioritic and other pebbles with some larger boulders. The upper part of the bank is all sand. In several other places these clays are afterwards exposed

Without exuctly knowing the spot where we landed. We encamped and got through the night, almost killed by mosquitoes.

Tuesday May 30 We set out again at 6 and after having followed the meanders of the still very large river for about 2 hours we arrived at the entrance of the northwest branch which we followed. Its bank are of the same character as those of the principal river, generally covered with splendid hardwood timber. Some distance behind the banks the land seems to become lower, more swampy. This north branch is almost still more tortuous as the Manistique River, has a very strong current, so shallow (?) it is impossible to ascend it by paddling.

About 4 o'clock we arrived at the fork of this branch river in two arms and encamped on the land tongue between the two rivers. Both rivers are as large yet as Huron at Ann Arbor. There is more pine woods than before. The river banks are sandy from 5 to 15 feet high; below sometimes clay strata and above the sand, ferruginous sand from admixture of fine iron mud. For the whole distance there is no actual swamp land immediately joining the river.

A part of the sand accumulations along the river seems to be of late date, large half-rotten pine trees being buried in them. But the principal sand covering of the district seems to be produced in the drift period or soon after.

Wednesday May 31. A terrible night it was. Myriads of mosquitoes tormented one in an unsupportable manner. I could not sleep at all and had to defend myself continuously from their furious attacks without success. At 5 o'clock in the morning we broke up encampment. Left part of our things with the canoe and started northwards on a lumber road along the principal easterly branch of the fork. We proceeded through pine lands mostly burnt out and through some which has been lumbered up to Township 44, Range 15 west to the fork of the river.

From there we went right westerly into 44, range 16, through extensive swamps which are prairie like and under water with occasional elevated spots in it on which pine timber grows but most of it is destroyed by fire. These swamps extend in a broad belt much further north and on the west side almost down to the fork of the river.

The land on which the road goes is high sandy, has here and there a thin ferruginous crust about one or two inches thick. Also in the swamps are with the roots of fallen trees similar iron colored sands brought brought to the surface, but as a general thing all the dry land as well as the swamp is formed by a light colored sand stratum in the whole district traveled through.

There I did not meet with enough good bog iron ore to bring home a cabinet specimen of it. This thin red mud is frequently seen in marshy places but does not amount to any practical value as all(of)it is mostly not over one inch thick. Some specimens at the sawmill of Manistique are of a better quality but I have not accurately learned the exact locality from which(?) they got it.

After crossing the swamps and reached the timberland on the western branch of the fork, we went somewhat southeast and struck the road again which we traveled in the morning and arrived at yesterday's camp at 2½. We took the boat down river again and in 5½ hours arrived at the principal stream of Manistique river, having encamped about half-way down and being terribly treated by mosquitoes.

Thursday June 1. Left camp ½ past 4 A.M. and entered Manistique river at 9½ A.M. after having encamped half-way down the side stream-terrible mosquito plague.

The banks of the principal river are all moderately elevated, consist of fine sand with argillaceous admixture. Most of its timber is well grown hardwood, little pine, in proportion. Under the sand frequently reddish gray tenacious clays with more or less admixture of pebbles are seen at the waters edge and a little above, about 3 to 5 feet. Camp Township 43, Range 14 W. Sect. 35.

Friday June 2. Did not sleep at all past night, so furious were the attacks of the mosquitoes, hands, eyes, ears all swollen and no possibility of a second's rest, millions surrounding one in spite of fire and smoke.

At 8 o'clock we went back from the river bank which is about 15 feet high, sandy, and descended somewhat into a marshy cedar swamp. Arrived at the southern town line. We followed it from west to east. Emerging from the swamp belt we ascended a hill about 50 feet high which consists of Niagara limestone. Specimens of it bear No. 10. The line runs over the top of the hill which is a continuation of the limestone outcrops lower down the river. Before reaching the centre of Section 34, the hill sinks down into a(n) extended tamarack swamp lining both sides of the creek running in the same direction with the town road only half a mile north of it.

I went through this almost impassable swamp to Sec. 33 but could not detect a trace of bog iron ore deposits and so returned to camp at 2 o' clock and departed immediately after arrival northwards along the river.

Encampment for the night in Sec. 23 near the creek running into the river close to the centre of the township. Character of river banks and timber growth the same as all along the river. Under the sand in several places clay beds crop out. River remains large but has many dangerous timber obstructions which however by some attention can be passed.

We are on a free(fine) landspur encamped and have the prospect of only being moderately troubled with mosquitoes. That will say the(y) are not in such enormous numbers as the former days. Still soon after they came.

Saturday June 3. Started 5½ A.M. Character of the land not changed. All hardwood. Proceeded Town 43, range 14 Sec. 14 close to the mouth of the second creek. Sent Gibbins to the locality marked bog iron on the map. He brought back some specimens but reports as a general thing the whole extended swampy district only in some single spots covered with a scanty crust of bog iron nodules scarcelyworth notice. The specimens are packed together.

The immediate embankment of the river is generally of very recent origin, it is sand on a argillaceous sand, under which very generally a thick stratum of tourf intermingled with more or less clay occurs. Also large stems of little altered timber lay under the surface sand on which however trees of old age have rooted.

We attempted after the return of Gibbins to continue our journey but after proceeding ½ mile further we found the river perfectly obstructed by driftwood and concluded to return because no road of any kind lead further up this way.

Sunday June 4. 5 A.M. commenced our return observing repeatedly the recent origin of the banks of river and the surface generally. Observed in going down the limestone ridge in Town 42, Range 14, Sec. 7, which is Niagara limestone like the strata mentioned in Town 43. This limestone ridge although not far from the river is separated from it by a low cedar swamp and is itself not very high. Therefore I had great difficulty in finding it.

The land forming the surface is most generally on the top for an inch or more colored brown from impregnation with iron rust. It also sometimes is cemented so as to form a soft sandstone. The argillaceous or sandy tourf strata of black color under the sand sometimes several feet thick, sometimes thinning out to one inch. I have mentioned.

Near the fork of Manistique river into the two branches which I navigated there are frequent exposures of drift gravel imbedded in a reddish gray fatty clay. The gravel is little rounded, consists principally of limestones of the age of Niagara group, but also dioritic and granitic boulders are common in it. Limerock of Sec. 7, Town 42, Range 14 is numbered 11.

The clay strata with pebbles are observed in one place being over 10 feet thick. The covering sand is of younger age and covers it inconformably, at least the surface of the clay is strongly unlulating and the sand indiscriminately covers it.

Monday 5. June. After camping the night on a sand bank in the fork of the two rivers we went down to Manistique saw mills. About two miles before reaching the mouth of Indian river the Manistique forms a series of rapids. The whole bed is formed of rock ledges and in a few places also in the bank a few ledges crop out. But generally the river banks are sandy. Still not very far from surface the whole low flatt district is underlaid by the Niagara rocks. Specimens of it will be marked with the following numbers.

12. Limerock at the upper rapids.
13 Specimens at the exposure next below.
14. Specimens on top of the lime ridge 1 foot and open quarry east of the sawmill.
15. Strata immediately below (18 inches).
16. Next following flinty limestones with many stromatoporas and sometimes whole layers of flint.

At the saw mill I found one of the owners Mr. Dean of Chicago. The strata in the river as he informs me by terraces go out into the lake. At the dam are 7 feet of ledges exposed above about 4 feet of hard limestones splitting in slabs with uneven surface and weathering assume a white earthy appearance. They contain indistinct fossils, Pentamerus oblong, 1 Favosites, 1 Fenestella, encrinite stems and particularly two kinds of fucoids, one similar to candagalli and one forming narrow stems, also a tail of trilobites I observed.

Under these are 2 feet of a crystalline dolomitic limestone with a great many half obliterated Stromatopora and a number of Pentamerous.

The lowest strata exposed at water's surface are also crystalline white and blue spotted. Under them forming lower and lower terraces the strata shale reach far into the lake where at a depth of 42 feet the limestone strata cease and a clay bottom is found. Mr. Dean informs me that the entrance of the harborlike river is 17 feet deep and not 7 as was represented.

Wrote to the Governor, and home, asking their appearance at Mackinaw the 4th of July, and sending word to the student that I will expect him in 10 or 12 days at Escanaba. Continuation of specimen numbers from the end of the second preceding page (See above).

17. Saccharoidal limestone with abundance of half silicified fossils of the usual Niagara species supposed to be the stratum immediately below No. 16 but the contact is not clearly seen. Thickness not known.
18. Limestone immediately under the saw mill. A few feet.
19. Next following strata below exposed in river bed. 3 or 4 feet.
20. Strata below in river bed with Pentamerus. 18 inches.
21. Strata at water's surface.

Tuesday June 6. Mosquitos are at night as bad as ever. In the morning went out to the line ridge east of mill. The hill is about 25 feet above the level of(at) the mill. A quarry is opened about 10 or 12 feet below its top. On top of the hill is sand strongly impregnated with iron oxyd. The uppermost strata by weathering have an earthy whitish and partly brecciated aspect but are much harder than they look. 4 feet. Contain some fossils. Under them are more crystalline and silicious limestones and whole beds of flint intercalated. They contain a great number of poorly preserved ordinary Niagara fossils and are about 3 feet exposed. Below the strata are not disclosed except some distance of where saccharoidal limestones with a number of the same fossils as before but also in poor preservation are contained.

Below this the limestone slabs under the(m) will seem to follow and gradually to pass into the similar slabs exposed as the highest strata under the mill dam. Packed up two boxes with specimens No. 2 and No.3 which promiscuously contain everything collected between Mackinak and Manistique. The clays and peat are not marked. They come from the banks of Manistique river, likewise the soft friable sandstones and different specimens of bog iron ore.

Wednesday June 7. Sailed out 4½ A.M. Shore unto the next point sandy on the first point to the southwest of Manistique the thin slab(b)y hard limestones which are forming the top layers below the dam of Manistique sawmills, are exposed in the bed of the lake. As far as the promontory goes scarcely any petrefactions in it except some compressed Pentamerus. A specimen of the rock from that place is numbered 22.

On the indentures of the coast sand beaches are formed which lay as elevated barriers before the low swampy land behind. A growth of small pine and cedar timber covers it. The following promontories exhibit on the beach the same slabs but no rock ledges are plainly seen unto(until) I reached the promontory of Point of Barques. About 3 miles eastward from Point of Barques the woods are instead of pine mixed or hardwood timber. About a mile back from the shore or sometimes more, is a strip of elevated land to be traced all along the lake shore in which the Niagara limestone crops out. Near Manistique, this ridge nearly touches the shore and also at Point of Barques it comes close to the shore at the hight of about 15 feet above the lake. Saccharoidal limestones with many silicified fossils of somewhat better preservation than seen before are found here.

The top of the ridge is covered with sand which in some places at the surface is very ferruginous. Also in the swamps near shore sometimes ferruginous mud is seen. The lake near Point of Barques throws out bluish limestone slabs containing a good many fossils. This stratum until present I have not observed in situ. Some of the fossils picked up from the saccharoidal limestone near Point of Barques will be marked with No. 23.

In the afternoon it rains hard and I took refuge in a house near shore.

The man with whom I stopped has commenced farming and is tolerably well satisfied with his success.

The whole point of Barques up to the place where I stayed consists of a terrace formed projection of the drift formation. The lowest portion of it is composed of regular drift gravel with preponderance of Niagara limestone and perhaps surrounding a nucleus of ledges of saccharoidal fossiliferous Niagara limestone of which a number of large angular blocks in irregular position peep out of the first elevated embankment of about 20 to 30 feet high. Above this are sand deposits in part quite ferruginous also about 20 or 25 feet which furnish a tolerably good agricultural ground. In some places in the water the Niagara ledges seem to be right close to the surface but no regular outcrops are seen.

Thursday 8. Weather cold but fair. After the shore up to the point was inspected 4 o'clock in the morning I prepared for departure and went out after 7 o'clock. Paid 1 dollar recompensation for night quarters.

After passing the point of Barques a large bay opens. The promontory on Town 39, R. 17, Sec. 17 is scarcely a foot elevated over the water and consists of horizontal ledges of Niagara limestone, which contain only very few fossils. The land all along the shore up to Pt.DeTour is very little elevated and bears a growth of young trees of mixed character.

The promontory in Town 38, R. 18, Sec. 4 exhibits about 10 feet of Niagara limestone all in slabs with uneven surface. The upper 5 feet contain not many fossils, only a few compressed specimens of Pentamerus The lower 5 feet are more argillaceous and contain a very great number of fossils but not in a good state of preservation; particularly the corals have lost all the more delicate marks of structure. The specimens collected at the shore the other side of Point of Barques at the place where we made night quarters are of the same kind. The strata have a dip towards the lake but not considerably. Specimens from this point bear No. 54.

Point DeTour is likewise a spur of Niagara ledges which in some places project about 7 feet over the waters level. The strata seem to be above the fossiliferous strata of the other promontory previously spoken of and contain only few very indistinct traces of large Stromatoporas and a species of Syringopora. The specimens are marked with No. 55.

Met Wadsworth at our camping ground already encamped. His boat bears the inscript(ion) Mich. Geol. Survey and is probably the boat belonging to me while mine of poorer quality is substituted. He also professes to have the tent belonging to the survey not with him.

The whole land spur between Bay de Nocquet and Manistique river seems to be an exposition of horizontal Niagara beds, in many places reaching the surface and in others covered by only a small crust of drift material or later sandy deposits.

The rock at some places of Ft. Defour are near polished down to an even surface while the unaltered roadbeds are of quite unlevel (?) uneven surface.

Friday June 6. Turner Island opposite our camping place at the western side of Ft. Defour presents near high water a shore lined with rocks of similar kind as those on our side but the escarpments are apparently higher mounting in the bay facing towards us to at least double of that. The Island is covered with mixed timber.

Little Turner Island higher up in the bay has a gravelly shore but no rocks protruding except on the northend where it approaches Rocky Island. It is generally covered with leaf woods. The highest elevation of both islands will not be over 30 or 40 feet. Martin's Island, seen to the south, is decidedly higher.

On the Defour side by sailing up the bay the first considerable rock escarpment is seen on the promontory beyond Elliots Harbor. There the Niagara rocks form a bold face to the lake of about 15 feet high all along the shore. Further on the rock walls rise higher and higher until the last mountain spur at the south end of the bay near the iron furnace rises to a hight of over 150 feet. The lowest strata are covered up by talus. About 50 feet above, regularly stratified limestone ledges of a hard brittle limestone sounding under the hammer crop out and retain with slight variation a similar character for the thickness of 50 feet.

The perpendicular rock walls have near the upper limits of this limestone an offset or small terrace rim which hides about 10 feet of t the strata. Still above are some similar ledges as those below.

Then comes the Niagara limestone with its uneven beds in an approximative thickness of 60 feet showing a great variety in its component strata. One highly crystalline, sparry and cemented together like a breccia is about 3 feet thick. Others are more in thin slabs or in thicker bulky ledges. But a close inspection of the sequence of all the subordinate strata is not possible, the escarpment being perpendicular and not accessible. From the fallen rocks I see that in some of the more upwards situated layers of saccharoidal character there is an abundance of the usual fossils but not in very fine state of preservation.

The promontory in whose indenture the Iron Furnace is situated forms also a perpendicular escarpment of about 40 feet which belongs entirely to the lower well stratified limestones seen in the escarpment below. The Niagara limestone has receded and probably forms the rounded top mass of the hills further back from the shore.

The bay between the two mentioned promontories presents a sandy beach. At the south of Garden Bay another bold promontory projects and presents at the shore line about 30 feet of the lower well stratified limestones supposed to represent the Clinton group.

The lowest of the strata there at water's edge has a very crystalline structure. Some other specimens evidently protruding there but not taken out of the stratum series are of a brownish mottled appearance. Another one highly crystalline picked up there may originate from the Niagara limestone. Above it is an indistinct specimen of Stromatopora. All the specimens from the point at Garden Bay are numbered 28.

The top of the hill seems also to consist of Niagara limestone but the rounded hill tops are densely covered with woods and show no open surface. The specimens from the promontory below the furnace bear the numbers 26 and 27.

From Garden Bay point we crossed the bay and entered Sturgeon River which comes out of a perfectly level sandy low country. At the point north of the river at low watermark, the well stratified limestone layers seen at the opposite side of bay are said to protrude but when I visited the spot the water was too high and I found merely a sandy spur. Specimens from Sturgeon river are No. 29.

The Sturgeon river has three rapids, one 10 miles from its mouth, one 14 miles and one 27 miles. The course of the river is very tortuous so much so that one of the proprietors of the sawmill(which is however burnt down now) informs me the course of the river 14 miles from its mouth counted in all its curvature would amount to 50 miles.

I proceeded on a lumbering road ober a perfectly flat sandy country 8 miles up to the first rapids (Friday afternoon) and encamped on the banks of the river which on the one side are about 20 feet high, on the other only 5. The embankment consists of sand under which about 5 feet above water rose-red colored well stratified fine clay beds crop out 4 to 5 feet thick.

Under them are a stratum of pebbles mostly limestone pebbles of about 3 feet thickness and derived of the same limestone which underlays it in large flat rocks. This rock is of greenish blue color, unequal rough sandy and clayey structure and contains occasionally traces of fossils. It is not so clearly developed here as two miles further up the river where it forms the rapids and crops out on the banks of the river in a series of about 10 or 15 feet.

Saturday morning 10 of June. I proceeded there after having passed a rainy night without tent. The limestones form the flat bottom of the river and crop out in the side of the one bank. They are of greenish argillaceous and sandy character of unequally harder and softer structure exactly the same as noticed two miles below. They contain in tolerable abundance a cyathophylloid coral in branching cespitose stems but poorly preserved. I saw also a few ribs of an Isoteles, a few specimens of a Leptaena, crinoid stems, Chaetetes and in a loose piece but of the same rock character a Catenipora.

In the pebble beds of Manistique river seen in connection with the red clay beds, fragments of a rock of this description were also predominant and must consequently be not far to the north of those localities be exposed and brought here by the drift agencies.

4 miles higher up the river the same beds as seen in the presenting (preceding) described position form the bed of the river in flat ledges, on which in immediate contact rests in the banks of the river the red well stratified clay without any intervening pebble stratum.

The flat land otherwise is very uninteresting for the traveler and continuing almost in a dead level onwards did not make it desirable to me to hunt up the upper rapids still 14 miles more distant and so I returned Saturday evening to the mouth of Sturgeon River. Specimens from Sturgeon River 29.

Sunday June 11. Contrary wind did not allow me to go out of the river and I had to remain all day.

Monday 12. Sailed out from Sturgeon River 5 o'clock. At 6 passed the island below Ogons Bay. The whole shore of the Island is covered with limestone slabs and dioritic boulders. No actual ledges seen. Also on the other following points I could not see any rock ledges. The limestones are of a peculiar kind and the few specimens of them are marked with No. 30.

Besides them there is an abundance of diorite and granite boulders intermingled. No rocks seen along the whole coast until arriving at the lighthouse at the entrance of Little Bay du Noquet. The whole spur consists of Cincinnati group limestones with the characteristic fossils but all in a very bad State of preservation.

At the lighthouse point are on the surface about 1½ feet of a yellowish silicious limestone with flint nodules. Below it are seen a few feet of blue argillaceous very fossiliferous limestone slabs. Further up the bay the strata rise a little higher so that ¼ mile north from the point 2 feet of silicious limestones and beneath 12 feet of blue argillaceous slabs are seen forming a perpendicular escarpment along the shore.

For two miles further no rocks are cropping out on shore but there again an escarpment of 25 to 30 feet rises again perpendicular. The upper 4 feet are silicious limestone, the lower 20 or 25 feet are blue argillaceous limestones and marls variously rich of fossils but no where are good specimens to be found. The number of the lighthouse specimens is 31. The number of the following 30 feet bluff 32.

On the shore for some considerable distance are slabs with very abundant chaetetes stems. It appears to me that they are the next following layers, below are blue argillaceous strata mentioned before. There number is 33.

We encamped in the bay opposite and south of Escanaba right a-side of the perpendicular rock escarpment of 30 feet hight and an extent of about 1½ miles. In the evening a heavy storm suddenly came on and we had trouble to save the boat and contents from destruction. The storm lasted all night and

Tuesday 13 the forenoon before the wind abated. I went south about a mile from our camping place when I found along the shore the strata replenished with Chaetetes cropping out, about 4 feet of them visible. They are evidently the next lower stratum under the argillaceous marls in the high escarpment described. The strata have not a uniform dip to the south but are somewhat undulating by which undulations these lower strata come to the surface.

Small diagram.

Full page diagram.

On visiting the high bluffs north of our camping ground where considerable of the rock was quarried in the hope of being a useful material which however was a great failure the exposure is about 35' high. I found that the lower argillaceous marls first contain streaks of limestone nodules which below merge into nodular limestone beds and finally under these the Chaetetes slabs just show themselves. The disclosures of the formation are very extensive but nevertheless I could not find any well preserved specimens. The centre of the shore escarpment is of Town 39 R. 22 corner between Sec. 36 and 25. Higher up the bay the shore becomes more low towards Squaw Point and about 3 miles up from our camp no more of the denuded strata is seen along the shore.

It is also not evident that there is any considerable rise of the strata towards the north. Squaw Point is not more than 4 or 5 feet above water and has sandy shore. Far out in the bay water plants grow. We arrived there Tuesday evening at 6 o'clock. Had two thunderstorms during the day.

Wednesday June 14. 4 o'clock morning, fine weather, cool. Passed Squaw point 7 A.M. Both sides flat, sandy. The high drift bluff along the shore up from Escanaba recedes from shore and appears again in the bay over which on the map falsely the railroad line is placed. The timber of all the land is young and small.

Entering Whitefish river the land remains very low and only some small drift hills rise above the general swamp level. A number of farmers from Sweden have settled on these and appear to do well. They have plenty of fine grass, plant good potatoes and oats and sell cedar posts.

The drift material consists almost exclusively of little worn slabs and pebbles of the Trenton group characterized by fossils and by lithological characters.

A number of them is of very unhomogeneous composition, purer limestone and siliceous strikes and rushes. The lime weathers out and the siliceous veins give the stone a very peculiar cellulose aspect. Some strong resemblance is between these pebbles and those found in the Manistique river, and also the pieces found in situ along Sturgeon River.

The remainder of the drift is red and mottled Lake Superior sandstone and diorites and granites. This drift seems to cover all the low area. At the abandoned sawmill three miles up Whitefish River this drift is peculiarly well to be seen. It is in the high bank on the mill side overlaid by heavy sand strata. It rained all the middle of the day so we took possession of one of the houses and encamped.

Thursday June 15. Started up the river with 4 days provisions. Left the boat in the river below the dam. Going up the road soon strikes the foot of about 40 to 50 feet high sand hills and follows it unto the creek entering the river about 1 mile above the mill. Then the road ascends these sand hills and continues on them for many miles. The whole district is an elevated pine plateau from which by fire all the timber has been destroyed for a widely spread area. I followed the road to the eastward and descended into the upper portion of the just mentioned creek. It flows over strata of shales with Lingula and some Bryazoa, also fragments of Trilobites and a compressed Orthis I noticed. I noticed the shales are about in the thickness of 15 feet exposed.

Iron there we returned to the main road leading up the river which continues to run over burnt pine land plateaus, a few times descending creeks in which however no rock is exposed. The sand stratum composing the hills contains drift pebbles and is 60 or 70 feet thick. We took a noon's rest at the bridge which crosses the creek about 6 miles above the mill. The creek bottom is an alluvial clay with vegetable matter.

After passing some distance through meadowland the road rises again and ascends in the subsequent hill elevations which amount to 150 feet. On the highs of this plateau the road winds itself along for quite a distance. The pine timber is in many places burnt out and one can see down to the flat cedar swamps through which the river winds itself. As a general thing the timber of the lower lands is mixed hardwood with only little pine.

About in the Town 45, Range 20 E. sec. 30, I descended to the river which is bounded by very low swamp land(cedar), and found the water rushing very rapidly over ledges of a hard crystalline bluish gray limestone with some small conglomerate stone but of a ferruginous pebble. The rocks are confined to the bed of the river and do not crop out in the banks.

In descending the very high sand hills over which the road I ade there are occasional fragments of the same rock found imbedded in the sand besides other waterworn pebbles of red sandstone color. The number of the limestone fragments from the creek is 24. The number for the Lingula shales 30.

Friday June 16. This morning at 5 o'clock I was surprised to see all objects covered with the dew'ade, the sun soon melted that away. But I noticed some previous days that fruits at this season are here very common. The young tops of fern(bracken) leaves etc. I found in exposed places invariably frost bitten.

Travelling a few miles along the principal road we took a side track descending over two sand terraces to the river. A broad belt of swamp and riverbed rock ledges are exposed which perfectly are the same seen yesterday in the rivers bed. Their mark is No. 36.

Returning to the principal road which keeps always on the high elevation alongside of the river bottom and must amount to 150 feet. We proceeded further unto the creek, Town 43 Range 20, Sec.5. as we suppose because there was nowhere survey marks to be found. The fire has been raging through all this district where the destructive hand of man has not worked. In the creek where we are now no rocks are exposed but in the sand of the hillsides are plenty of drift pebbles.

In following the creek down to the lake ½ mile distant the rocks are found in large ahgular blocks in the bank, mixed with drift material but although the real ledges are not seen , the(y) must be near by and the large rock fragments belong to these strata. They are numbered 37.

Not intending to go up to the lake Superior side and with not much hope of further great disclosures I turned back and encamped at the last nights ground. Before reaching it I noticed to the left hand of the roadside a series of about 50 feet high hills which consist of sand accumulation with a considerable proportion of drift pebbles, particularly flat, little-worn pieces of the rock found at the lake which is the terminus of our journey. The two specimens collected from these drift hills are numbered 38.

Gibbins after coming into camp went down to the river in a direction about middle between the locality we seen the day before and the one we seen this morning and found it running very rapidly over rock ledges of the already mentioned character that is like No. 34.

Then we went to the small lakes represented on the map and found them behind the 50 feet high gravel ridge of which I spoke in the evenings report surrounded by low swampy tamarack lands. No rocks of any kind exposed. 1 dollar boat hired.

Saturday 17. We returned by the road to the mill where we arrived at eleven A.M. At 12 o'clock I took a small boat and paddled up the river about 3½ mile. The river dam has inundated the low swamplands along its sides and formed in this was a sort of a long lake in which the killed tree stumps stand yet.

Passing this lake and following the river up about 1 mile further there are for a considerable distance rock ledges forming the bed over which the water rushes with considerable rapidity. In the banks no rocks crop out.

The rock is the same as found in the rapids above. Its number is 39. On the exposed rock ledges in the river are a great many big dioritic rounded boulders dispersed. In the sand hills the limestone fragments belonging to the neighboring rocks are always angular, not water worn, while those from remoter strata are rounded.

Sunday June 18. Returned down the river half past 6 A.M. In the river there are some distinct indications of tide motions. I saw repeatedly some sandbanks at times dry, at other times fully covered with water, but neglected to take notice of the exact time it was so. Having contrary wind I landed at the mouth of Days River and proceeded by land to Escanaba sending the man with the boat ahead.

Right above the mouth of Days river the ledges of the Trenton group are exposed in the bed of the river and continue so for more than two miles upwards. The road follows the river and does not run as indicated on the map. The strata are much like those seen on Whitefish river but seem to be higher strata of some more argillaceous character. Further up the limestones have the mottled character with purer softer limestone portions and harder silicious veins which by weathering stand out in bold relief. Very few fossils are in it and those poorly preserved. The successive exposure of strata can not be positively ascertained but they must be 40 or 50 feet thick, all slabs with uneven surface . No good building material among them.

Higher up the ledges disappear under the drift sand and the road ascends a high plateau at least 150 feet on which one travels over a burnt out pine plain until reaching the Marquette railroad track which gradually descends to the Escanaba River. In the River Rock ledges begin to appear again but the railroad does not sink down to the rock and continues on the drift sand until Escanaba City. The river is falsely placed on the map. It enters the land 3 miles above Escanaba City, also the railroad runs in an entirely different direction as indicated on the map. The specimens from Days River have the number 40.

The distance from Days River to Escanaba by land is about 14 or 15 miles. Arrived at Escanaba 5 o'clock in the evening. The boat had not arrived that evening and nothing is to be seen of it yet. Mr. Marck which I expected to find here has not arrived - nor any letters. Hotel Escanaba - Tilden House. Paid to McCarty 2 dollars.

Monday 19. Was introduced to Mr. Baldwin, President of the Escanaba and Negaunee Railroad. He gave me all the information he could and furnished me with a pass to Marquette and one for the man with a boat he delivered 44 miles along the road to S.C. Shmidts mine from which place the boat has to be transported 4 miles to the Escanaba River.

In going to Marquette at 5:10 in the evening, I observed the whole plateau from which I descended the day before composed of heavy drift sand deposits. The sand is light colored for the first 8 or 10 miles. At Days River Station which is 13½ miles distant the sand is intensely colored with iron.

At Maple Ridge the railroad cuts through about 4 feet of lime rock which is overlaid by about 3 feet of red colored drift material. The rock is apparently the same as the strata exposed in Days River. Further on about 46 miles from Escanaba there is another exposure of rock in a railroad cut. It is a whitish soft material but in the velocity(s of passing I could not accurately observe its nature

Soon after the plateau begins to show some protuberances of dioritic slate rock and in approaching Goose Lake the country has assumed an entirely changed aspect. The slates and quartzites of the Huron formation project in bold hills and everywhere the iron ore strata come to the surface. In the depressions between the hills are considerable drift deposits continuing.

Approaching Marquette the hills of the Huronian rocks are again of less elevation being almost subdued by a heavy covering of drift material. Still the rock comes in many places to the surface and forms a large escarpment on the lake front of the city.

Tuesday June 20. 8 A.M. returned to Negonee, having failed to meet Mr. Brooks in Marquette as I expected. Before I left Marquette in the morning I inspected the dioritic rocks and intercalated shales bordering the coast.

Going eastward about ½ mile from the Northwestern Hotel in a valley close by the road there is a quarry of red sandstone opened at the foot of the protruding diorite rocks. The sandstones are exposed about 15 feet, lay horizontal or nearly so in discordance with the diorites. The sandstone is quarried in spendid dimension stones of any required size. Its color is red in some layers with greenish white stripes or dotted with whitish round spots. The lower beds of the quarry are of an equal dark red color. There are also in some layers large pebbles imbedded and some blocks of a perfect conglomerate of pebbles laying round prove that such a stratum is near by exposed but I had not time for further investigation. Hotel bill 2.50

Started with railraod back towards Negonee about ½ mile from Marquette. The red clays often mentioned are seen under the drift sand. The road ascends gradually until Franklin Station from where there is a splendid view on the lake.

At Negonee saw Jackson mine, a grandious development of ores. Dug out by the simple process of quarrying. Thickness of ore beds immense. The strata are elevated and bent in the most multivarious manner and the different varieties of ore are quite considerable. The contiguous rock with like ore is a talcose slaty ferruginous rock. Close by are diorites, In another small mine close to town, MacCumber mine, there are ores of some different aspect and in the bed and roof rock are many brownish quartzite bands. The accompanying rock is also a greenish slate.

S. C. Smith's mine, 44 miles from Escanaba. The mine is about 2 miles west from the railroad. Before reaching the concerned railroad station there is an exposure of horizontal strata of white color and soft grumbling (crumbling) consistency. It is a sandstone and not as I yesterday remarked, a marl.

The six miles to the Smith mine lead over a sandy plain until reaching the neighborhood of a western branch of the Escanaba where frequent granite hills about 10 - 12 feet high protrude and continue so from time to time unto the main branch of the river. At the river's bed where we put in the boat is a red colored granite.

Another mine is 1½ mile west from this place. The ore projects at the surface for the distance of 1½ miles which are explored. It is in one location a hard ore, in another a very soft micaceous ore of great purity. It appears to be a very valuable location but is not opened yet properly. Specimens of it I collected and will mark them separately. On the land stands a splendid growth of hardwood. All the timber between the railroad at Escanaba is burned.

In connection with this red granite is seen an aphanitic diorite in the river bed closely above and to the diorite some of the red granitic rock is intimately adhering. Paid 3 dollars for team.

Wednesday 21. Started down the Escanaba river about 5 o'clock. Over brisk rapids over granite rocks for the first mile. Then the river enters a level country with a middle elevation over the river bed of 5 feet. The banks are composed of gravel deposits with no limestone intermingled. Timber pine, most burnt out, or mixed hardwood and cedar.

After about 3 miles run the northeastern branch of the river enters constant rapids. Sometimes large granitic blocks in the river bed.

About 6 miles from our starting point there are for the first time numerous limestone fragments mixed with the gravel exposed in the bank. It is an earthy arenaceous limestone in slabs of yellowish color, which contain a lingula. Rock specimens from that locality are marked 41. The place is near T. 44, R. 25, Sec.3, a marked tree standing not far beyond.

Sand and gravel banks continue. Water at times running at a moderate rate, at times in rushing velocity over gravel beds. No rocks seen yet in the river banks.

Several miles downward for the first time some rock ledges are visible in the river. They are associated with loose pieces as in locality No. 41. The specimen from this place is numbered 42.

At ten o'clock we are in Town 44, R. 25, Sec.22. Gravel with limestone slabs exposed. Not far below is the entrance of the creek on the west side with rock exposures of about 3 or 5 feet continuing some distance down the river. The specimens are marked 43. No fossils observed.

At Town 43, R. 25, Sec. 3, the river runs in rapids over flat ledges of rock which is the same as No. 43. Somewhat below the river falls quicker than the strata and cuts little down into them. The strata thus exposed are marked No. 44.

At the junction of the west branch with the main river again, the upper identical with No. 43 form the surface rock. A specimen from there is numbered 45. Specimens from the mouth of western branch 46.

No. 47. is a short distance below forming an embankment of about 3 feet. It is the same as 43. The same strata continue a good way down the river. Then for some distance the rock disappears again and gravel and sand shores are lining the still very rapidly descending river. We pass T. 43, R. 25, Sec. 13 & 14 and have no exposures yet. A half a mile or so below rapids with exposure of No. 48.

Soon after the creek from the west flows in, in a very rapid course and rapids continue. The again the rocks disappear and river flows quietly for about a mile. Then a series of very strong rapids begins. No. 49 is a specimen from the first exposure again. No. 50 from a place somewhat below. The rock ledges now begin to project in the river bank about 6 and 8 feet. They are composed of uneven slabs from 2 to 3 inches thick with scarcely a trace of fossils. The strata keep about an equal descent with the river and remain the same. No. 51 are from the projecting banks. Lower down the banks of projecting rock are getting somewhat lower or even as low as the water's edge. The water runs very rapidly over the flat ledges. We encamped for the night not far above the place there a small creek enters from the east in Sec. 30, T.43, R.24

Thursday June 23. I proceeded down the river at 8 o'clock. Specimen from last night's camping place No. 52. Spec. 52.1 is 4 feet above the other specimen marked 52. It is not a mile to the entrance of the creek below from the east. Rapid run of the river continues. Exposures of rock ledges having the same character as before. Sometimes they just emerge from the water's edge, sometimes they form embankments about 4 feet high. A specimen from there is No. 53. It is the thickest stratum at the foot of the embankment. Above it are 5 feet more rock ledges in slabs of similar character.

½ mile further down after the ledges were hidden for some distance again feet feet of ledges emerge. The lower stratum is peculiarly mingled with silicious veins which weather out in relief. It is No. 54.1. Right above it are about 3 feet of slabs which contain a great many indistinct bivalves and Chaetetes. They are 54.2. Above it are 3 feet of slabs numbered 54.3. The whole complex(complete) of strata fall almost equally with the river, at this place they do a little more so.

Among 54.3 are strata which perfectly seem to be identical with the rocks that formed the banks of the river and its bed for some long distance upstream. Strata 54. 2 and one are actually lower strata.

In the further progress of descent the strata 54.1,2 & 3 are seen in the river banks and immediately above a thin bedded limestone with silicious nodules and veins follows which contains a number of fossils. Rhynchonella. Leptaena, bivalves, Tetradium, several Orthoceratites, Chaetetes and [illegible]. These fossiliferous strata are numbered 54.4.

Further on the next lower strata are on the surface, the strata 54.4 missing. About ¼ of a mile further down only rock fragments are to be seen. For about a mile onwards, then rapids again with exposure of 54.2 and 3 not much missing above water's edge. Then another ¼ mile without exposures and low flat banks. At Town 45, R. 24, Sec. 21 & 22, the strata 54.2 and 3 are exposed. The specimen from there is No. 55.

For quite a while there are no exposures then rapids again over 54.1,2 & 3 exposed from 1 to 3 feet in both sides of the bank for about 1 mile. 54.1 particularly exposed first, then 2 & 3. Strong rapids at that place. In the stratum considered to be 54.1 I found Columnaria alveolaris and [illegible]atocerium.

No. 54.2 is more arenaceous than above, contains various fossils. 3 is more argillaceous and the 3 numbers are apparently thicker than in the former exposures. 1 is exposed 2 feet, 2 and 3 together 8 or 9 feet. Stratum No. 4 with Tetradium lies above them but is not seen here. Specimens from this locality are marked 561 and 562 for the higher strata.

A few 100 yards below the strata which here projected 6 feet above the water are only 2 feet above its edge but immediately rise again as we now approach big falls where the water rushes about 5 feet perpendicular over ledges considered equal to 54.1 & 2. Right at the top of the falls there is at the lower edges of 542 a large Tetradium 4 feet in diameter. Below the falls about 4 feet of lower strata are exposed which however are to my estimation not deeper than 54.1. They contain in some limited spots Leptaena Isotoles, Orthoceratites and other fossils.

In strata of higher position there are some cyathophyll, Leptaena and other fossils. The strata exposed at the falls and immediately below amount to not much more than all 12 feet. The dip of the strata and the fall of the river are about equal. The strata from the falls are marked 57, the upper layers 58.

About 1½ miles below the falls the strata continue to be about the same and so down to other still more considerable falls. Then a descent of about 6 feet is made in which 7 specimens of rock are collected. The lowest one is 59, the uppermost is 65, which is identical with the river bedrock. At the upper falls all these strata are deposited in thin uneven beds the lower ones 4 to 6 inches thick, the upper ones much thinner, wedge-shaped.

The river runs now for more than a mile with great rapidity through a narrow channel lined on both sides with rock walls 15 to 20 feet high of the described nature.

The lower beds 60 or 8 feet are composed of tough cilicious crystalline limestone beds. No fossils observed in them. The upper beds amounting to 10 or 12 feet are composed of the beds described above the falls. They contain Stromatocerium, Columnaria, Cyathophyllum, Tetradium, several brachiopodes sctr. Above them thin uneven bedded wedge-shaped layers 8 and 10 feet thick are deposited. They contain the same fossils, but few. Columnaria alveolaris is found in a bed at the top of them.

After having passed the canon the lower strata disappear under the bed of the river while the upper strata with Columnaria and stromatocerium continue, the wedge-shaped limestones above appear to have a greater thickness amounting to 10 feet. Specimens at the end of the canon where I encamped are No. 66. They are of the region of Columnaria alveolaris 2 and 4 feet above waters edge. No. 67 is from the higher wedge-shaped layers about 10 feet thick.

Friday 23. Specimens from the other side of the river in sight of last night's camping ground just opposite the entrance of a creek on the east side are No. 68 . The creek runs in rapids over rock ledges. No exposures in the banks for ½ mile below the entrance of the water. Then rapids again, large rock beds in the river. Then falls of 3 feet cutting through the uneven bedded wedge-shaped limestone beds. As I described before Stromatocerium in these layers. Besides Brachiopodes in one of the beds there is a great number of stictopora or Fhaenopora silicified, Leptaena, some gasteropodes, crinoid stems, Chaetetes sctr. Specimens number 69.

Half a mile below above the rocks seen until now there is a series of about 9 feet which have not been exposed before. Above the uneven bedded slabs there sets in some beds of limestones in 6 inch layers which in places are full of bivalves and crinoid stems. Their No. is 70 Above them are 7 feet of earthy looking limestones in beds of 4 to 8 inches thickness. They are No.71. The locality is right below the entrance of a good sized creek from the west side.

Now the strata fall quicker than the river and some higher strata line the banks of the river. About ¼ mile below locality 70 and 71, after a short interruption of the exposures, there are ledges exposed, which having in general the same aspect as those formerly seen, still there is no particular stratum exactly to be identified in the whole complex of all the series. There is evidently a frequent repetition of layers which have the same general appearance. In particular I mention the strata which are penetrated by silicious veins in the bank and not weathered. These do not show much but as soon as they are exposed to the water the lime is discolored and the silex comes out in strong relief.

The strata there are more argillaceous and more intercalated with argillaceous seams. I found there a whole Isotelus gigas in the stratum at the water's edge. In the same horizon are numerous good specimens of orthis. Rhynchonella. Somewhat above in the uneven bedded limestones are Chaetetes, Lycoperdon in flat disc. Specimens from this locality are numbered 72.

Continuing to run downwards still higher strata are seen about ¼ mile from the last mentioned locality. There is an escarpment of about 12 feet. Thin nodular argillaceous and silicious limestone layers with intercalated slaty clay of blue color. In the upper terminus some harder and thicker limestone beds of purer quality set in. These strata abound in fossils of the Trenton group. Also Stromatocerium is found in it.

½ mile further down above the upper limestone strata are still higher and very argillaceous beds deposited which contain the same fossils as before but all much nicer preserved, being loose in the soft argillaceous seams or on the surface of the limestone slab. In addition to the other fossils there comes a great abundance of Leptaena sericea which has not been seen before.

The strata are variably rising and sinking again above and below water's edge. The whole complex of the lower and upper fossiliferous strata presently described may amount to 25 feet. The fossils from the two localities are not marked with a number. The principal exposures are about in Town 41, R. 23, Sec. ? ~~28~~

Saturday 31. Going down the river the uneven bedded wedge-shaped limestones emerge about 12 feet. Above them 5 or 6 feet thicker beds with much silicious matter in veins and nodules. Above them the fossiliferous calcareo-argillaceous beds. Further downwards above these appear hard limestone beds with large course silicious veins and nodules. And above them 10 or 12 feet, thin uneven bedded wedge-shaped limestone layers of the same appearance as the beds above at the falls and the canon of the river, which I consider as having their place below the fossiliferous argillaceous strata. ?

They contain Leptaena sericea, orthoceratites, crinoid stems, Leptaena alternata, orthis ectr. And still on top of them 8 or 10 feet hard crystalline gray limestone in 6 or 8 inch beds which perfectly resemble the crystalline limestones of a much lower position, this stratum has not any fossils as far as I observed. The specimens from it are No. 73. The locality of exposure is about 1 mile above the island. Below the island are high drift accumulations in banks of 30 feet high.

Then I approached the lower falls which run in three offsets about 12 feet perpendicular down. The rock walls inclosing are about 15 feet in all. They consist of the thin bedded wedge-shaped layers above the falls and below. In the upper horizon the strata are somewhat thicker and less argillaceous.

At the Falls very few fossils are found and on account of the great general similarity of the rocks there is no stratum particularly marked to keep strict account at what horizon one stands. Still the lower strata below the falls decidedly assume the aspect of the blue argillaceous fossiliferous strata mentioned before and soon these actually come to appearance in their full fossiliferous richness.

Above again thick purer limestone beds with silicious veins appear and above them again the uneven bedded wedge-shaped layers also with much silicious matter are placed. They contain Leptaena sericea, Isotelus gigas, atrypa modesta ? in some streaks orthoceratites. Leptaena alternata. These limestones occasionally inclosing thicker beds form the surface rock down to the lower mill dam where they gradually are getting washed away unto a few ledges amounting to a couple of feet.

At the mill in the mouth of the river the next lower thick coarse silicious banks crop out at the waters edge and some feet above. In the mill locality I found in the wedge-shaped limestones Leptaena sericea, atrypa recurvirostra covering the surface of a whole stratum, a very large head portion of an Isoteles which must have been 4 inches wide and several other fossils none of which however was good enough for collection.

At 4 in the evening I arrived at the mouth of the river making the way to it with great difficulty because the otherwise large river is in its rapid descent so low as to be entirely unfit for navigation even in the smallest flat bottom boat.

Sunday 25. At Escanaba. Received letters from home. Arranging the packing up of the large stores of collected specimens.

Monday 26 and Tuesday 27. Engaged with packing my collections. Expenses for boxes and wrapping paper 3 dollars. Paid to McCarty 2 Dollars Hotel bill for the two men 15 dollars. Hotel bill for me 3.50. Met with M.T.B. Brooks and arranged with him as last fall work. A trip down the Menominee river, meeting him at Marquette.

Wednesday 28. Strong blow. Could not get out of port. Delivery of 6 boxes of specimens to the Railroad Co. for transportation. Boxes No. 2 to 7. Thermometer in the morning hours 50, at noon 56 during sunshine. In the evening again only 50 degrees.

In the morning of the 29 at ½ past five it was 42°. About 7 o'clock we sailed out towards the bluff about a mile back in the bay from the lighthouse. The Cincinnati shales and limestones as already described in coming up the bay are there exposed in a bluff about 15 or 20 feet high. The fossils are all in poorly preserved condition and there is also no great variety of species to be seen. Having passed the lighthouse Burnt Bluff presents its bold Niagara rock towards us. At 1 o' clock we arrived there. A series of specimens is numbered, the lowest one is No. 73. It lays about 3 feet above waters edge.
74 is about 4 feet higher up.
75 is about 15 or 20 feet above the latter.
76 is still 10 feet above.
77 forms the first terrace 10 feet above the latter.
78 fossiliferous crystalline nodular limestone at the base of the upper terrace.
79 Crystalline limestone immediately above the former.
80. Somewhat uneven bedded limestone slabs, 5 or 6 feet thick.
81 Crystalline fossiliferous(few fossils) nodular limestone.
82 Even bedded limestone slabs forming top of cliff about 15 or 20 feet thick.

Diagram of foregoing description.

At the southern end of the cliff there are still higher strata above 83. They are followed by about 12 or 15 feet uneven bedded crystalline somewhat wedge-shaped limestone slabs with flint bands and some of the usual Niagara fossils. Their No. is 83 and 84.

Likewise there is a lower bed of limestone visible at the water's edge which I number 75.1. The whole series of strata is so much of one type in the higher and lower strata that I hesitate to consider the lower strata as representing the Clinton group. At all events such an assumption is not based upon any palaeontological or lithological character.

In the lower third of what I called the first terrace which however in fact is the second there is an irregular band of about 2 feet thickness of a brecciated sparry or stalagmitic limestone intercalated between the regular well defined layers. I number them 76.1. In the limestone beds near by are flinty nodules abundant. One of them is numbered 76.1 likewise.

Friday June 30. Contrarious wind. Cannot sail out. During forenoon some little rain. Very bad weather during afternoon and night.

Saturday July 1. Wind does not allow going out. Ascended the bluff again. There is about 20 or 25 feet of rock still behind the top of the bluff. The uppermost layer seen are hard uneven bedded limestone slabs several feet thick. No. 86.

Below them there are about 10 feet of saccharoidal yellow limestone with a great number of silicified fossils but not in good state of preservation. The specimens would according to the adopted series number be 85.

Below them are thin bedded uneven limestone slabs with occasional flint seams 12 or 15 feet thick. They correspond with No. 83 and 84. Below them are about 15 feet well stratified layers corresponding with No.82. Under them about 5 feet of rough crystalline indistinctly bedded limestone corresponding to No. 81. Below well stratified banks 15 or more feet forming the base of a part of the upper bluff corresponding to No. 79.

Afternoon visited the lower bluff south of the one described. The lower well stratified banks corresponding to the lower portion of the middle terrace at the other locality contain a large number of stromatopora in a certain layer. Above it is a brecciated white calcareous rock in a seam of about one foot. A few feet higher there are numbers of nests of such white calcareous deposits and a few feet still higher there is the conglomeratic brecciated stratum which I have made mention of at the upper bluff.

The escarpment at these lower bluffs is at least 30 feet and from its top **or** upper portion large masses of saccharoid limestone have fallen down which contain Favosites, Stromatopora etc. but not well preserved.

In the evening at 4 o'clock we sailed down the bay first with contrary wind, afterwards with good wind. Arriving at Point Detour there was such a tremendous sea that we could not land so we had to proceed and after spending half the night with sailing till the wind died away we anchored and early in the morning got under way again so that Sunday morning, July 2 we was at Point of Barques taking breakfast.

The whole point is an accumulation of loose rock fragments of the upper Niagara group with a great many fossils, some tolerably well preserved. I made collection of a number of them. At seven A.M. we got under sail again pointing for Mackinac.

A little **after** 12 we arrived at Seul Choix where I received all the mail sent to me since my departure. At Seul Choix I found in the lime-stones a number of specimens of Huronia vertebrator but like all other fossils from that place poorly preserved.

Monday July 3. Up in the bay several creeks come in with rocky banks. Between two of them there is a plateau of only moderate elevation and about ½ miles square on which the flat naked rock beds are exposed barely covered with some moss or herbs. The rock beds at the first creek are the crystalline lower strata of the Niagara group. The specimen is numbered 30.

Gibbins I sent up to investigate the bog ore north of Seul Choix which are reported as being very important. Some one connected with the Wyandotte Furnace has been up there a year or two ago.

The wind was against me so I had to wait until 3 o'clock when I started but with little success. We reached the shore about 2 miles from Seul Choix and encamped at the mouth of a creek. The first promontory after Seul Choix is very rocky, further on the beach is sandy. The place of our encampment must be about 4 miles from Scotts Point.

Tuesday July 4. No wind. Foggy. We took the oar and rowed on towards Scotts Point. There are a remarkable number of small creeks entering the lake on this line. On all the promontories there are big Niagara blocks in the lake and on the shore but generally the beach is sandy. Near Scotts Point somewhat west of it the rock ledges seem to crop out. At the point itself there is a high sand bluff running out into a spur of big boulders and pebbles.

We passed Mille Coquins and Biddles Point sailing for Epouffetes Harbor where we encamped at a fishing station. The shore is lined with Niagara rock fragments and about ¼ mile wide belt of flat swamp land borders the lake which at no great depth is composed of ledges of Niagara rock.

The background is formed by high sand hills of about 150 or more feet elevation. This belt of sand hills is to be cited to be about 3 or 4 miles wide. Behind it shall be elevated level sandy grounds underlaid by rock according to the reports of the people living at the fishery.

Wed. July 5. Sailed out at ½ passed 5 A.M. had for a good while rain and no wind. Then we had for a short interval good wind which soon died away and we laid almost still arriving at Point de Chenes after 12 o'clock. At ½ past one we got a slight brise(breeze) which allowed us to sail. At ½ past 2 we were at the east end of St. Helena Island.

Looking towards the northern peninsula the hills forming Gross Cape and the elevated portion of Pt. St. Ignace project in a very characteristic manner from the surrounding landscape and indicate at once by their form a difference in geological structure. The brecciated limestones project in perpendicular rock pillars ; while following the same niveaux the hills form in other places steep escarpments which are not composed of so distinctly brecciated rock masses but are rather regularly stratified calcareo-argillaceous beds. On top the formation exhibits a much greater multitude of fossils than towards the base.

The wind died away again and we had to row all the way to Point St. Ignace where we stopped on account of rain and expecting some wind in our favor. Expenses 5 ns(five) dollars.

Thursday July 6. Continuous rain with southeast wind hindering us from going out. Finally hired an experienced boatman to bring us to Mackinak, my man failing to undertake it. We safely arrived in the noon time. Provisions was all damaged by the rain so I had to throw away part of them. Paid off the hired man and dismissed him from further service. 30 dollars for 1 month and 17 days. The same day my family and Mr. Mark arrived at Mackinak.

Friday Jun.(July) 7. Excursion around the Island. Wrapping paper received from Mr. Lederle. Bill 5 dollars. Drying of provisions to Baker. 50 cts. 5. packing boxes.

The boat leaks very bad and is from everybody pronounced as rotten and dangerous, so I sold it to Mr. Bronilow and Baker for the sum of 50 dollars and bought a new boat of a little larger size for 325 dollar

Saturday the 8. I had to unpack and dry all my specimens which were wet through. Necessarily there was to some degree an intermingling of specimens from different localities. It is therefore by unpacking necessary to preserve carefully the numbers on the specimens or other kinds of labels. Some are not labeled because they were all from one locality and easy recognizable.

I expected my woodsman back in the evening but the vessel which had to bring him did not touch the place so I will be under the necessity to send for him in some other way not yet determined upon.

Sunday 3. After a severe thunder storm last night the weather is clear. In the Friday's excursion to Arched Rock I descended the arch down to the beach. The upper portion of the breccia is very fossiliferous though the fossils are not very well preserved. Among other things I found a large pygidium of Bahrannia and a pygidium of a Phacops, Rhynchonella trigonalis retr.

The separation of the upper fossiliferous well stratified portions of the island and the breccias below is not defined. In contrary the breccia contains some large masses mingled in its body which are fully identical with the undisturbed stratified portions above. The fossils found at the beach back of Robisons Folly from which in a former memorandum I was doubtful whether they are cropping out in the lake, are evidently being fallen down from the upper portion of the precipitous rocks lining the shore. Expence for wrapping papar 5 dollars. For paint and brushes .50

Friday 14. About 4 o'clock we left Mackinaw and reached Little St. Martin's Island about dark where we encamped on a low somewhat detached point at the southeastern end of the island. The lake bottom and shore are composed of drift pebbles with an admixture of red and variegated marls and some grayish white impure limestones which belong to the Onondaga salt group whose layers can not be far from the surface at that place. No gypsum seen. The island as a whole is not much elevated above waters level and all round no rock exposures could be noticed. A few specimens of the variegated marls and a piece of limestone are collected and numbered 97.

Saturday July 15. We sailed with contrarious wind towards Cary River could not touch big St. Martins Island being prevented from doing so by the wind. Cary River has at its entrance low swampy banks also along the shore line. No where along our way we noticed any rock exposures. We arrived at Cary River 10 o'clock A.M. About half a mile above its mouth there are rapids running over rock ledges with a somewhat southerly inclination and an undulating surface. The exposed ledges amount to about 4 or 5 feet. Are a heavy brittle limestone with earthy fracture with uneven surface as if grossed in a half soft condition. The rock contains crystals of calcspar, reddish colored and shaded spots and is sometimes very argillaceous.

The layers are 6 or 8 inches thick. Above them is a few feet of gravelly clay forming the sub-stratum of purer rose-colored well stratified clays analogous to the often mentioned clays of Norita (Manitè) Island Manistique river and many other places. They are about 5 feet thick . Finally are 6 or 8 feet of sand forming the surface with hardened ferruginous strata on the upper superficial portion same as on Manistique river.

Nearer the mouth just opposite the lower saw mill is a 8 feet thick stratum of blue clay with very much vegetable matter with a number of sweet water shells. They crop out under a stratum of pebbles of more angular form being debris of neighboring strata.

This clay is of much more recent age than the rose colored clays above this locality. They are however fully conform(able) with the peat clays along the Manistique River. The specimens of rock from this locality belonging to the Onondaga Salt Group I have numbered 88. The clays are not numbered.

In the evening we sailed up to the Pin(e) River mouth. Flat shores. No rock exposed. Exposures are said to be higher up.

Sunday morning July 16. We rowed up the river two miles where rapids are for a short distance running over large drift boulders and angular blocks of limestone, all belonging to the Niagara group according to the fossils and rock character. 1 large Catenipora among them. Immediately over these boulders the pink-colored often mentioned clay beds are cropping out. Lower down the river no exposure to be seen and higher up, the water runs slow again between low alluvial clayey banks without indications of rock ledges which I suppose however must be immediately under the boulder stratum. The specimens of Niagara rock from this place are numbered 89.

At Carp River in yesterdays diary I neglected to mention that among the loose rocks in the river some pieces evidently belonging to the same strata which are exposed contain distinct traces of cyathophylloid stems and casts of a gasteropodes besides traces of some other organic remains.

From the mouth of Pine River we sailed about a mile to the east where a fishermans' house stands on the wellexposed ledges of Niagara rock dipping towards the south at a small angle. Specimens are No.90. No fossils seen. There is a limestone elevation from there in the direction backwards towards the rapids of Pine River where we just came from. This point is the first outcrop of Niagara limestone east of Pt. St. Ignace. From here to the east the coast seems to be exclusively belonging to the rocks of that age.

We sailed now south to big St. Martins Island where Mr. Wendel reported to us that gypsum crops out under water near the dock of a fishery on the east end of the island, and he (at) the same time said that he brought from this spot a large block to Mackinaw. We did not approach the dock near enough. And I was under the impression Wendel's description directed us to a place further south but there no rock comes to the surface. The island is in its principal part at all events composed of drift material with big boulders of dioritic rock of Niagara limestone.

The same composition has the eastern promontory limiting St.Martins bay. The pebbles and blocks of the drift material are mostly Niagara limestone. In one I found a Eurypta vertebrate. This condition of the coast remains the same on to the Chenaux Islands. The land 5 or 6 miles back from shore is a high ridge composed probably of Niagara limestone.

South of Marquette Island we landed at Goose Island. The island itself is a low gravelly elevation. On the east shore of it about 5 or 6 feet under water are large snowwhite patches of gypsum to be seen in connection with a bluish clay and some flagstone ledges. The island itself I could not investigate the water being too shallow to approach and to effect a landing.

We arrived Sunday evening in Beaumont Harbor boating up the bay against a severe gale of headwind. At the harbor was assembled a fleet of 6 steamers to remove the big cribb (?) used for building the Spectacle Reef Lighthouse on it. We intended to have many things regulated in our boats outfit but arriving as such a busy time we could not claim much attention and help from the occupants of the place. No. 91 are the specimens from the drift of Ft. St. Martin.

4 Dollars for provisions. 55 lb flour. Monday remained at Beaumont Harbor fitting up the boat.

Tuesday July 18. 5¼ a.M. Departed passing Strongs Island and coasting along to Beaver Tail Point. The numerous islands and projecting points are all lined with large blocks of Niagara limestone. At Beaver Tail Point there I landed and took dinner the rock is of the usual crystalline structure but contains no fossils or at least I did not find any. Specimens No. 91 represent the rock of that place.

From there to Huron Point the rocks are in detached blocks strewn along the shore and in the shoal lake bed. But from there almost to Detour lighthouse the low shore line is no more rocky but either formed by sand or gravel. At the lighthouse and a few other places the limestone blocks project again in the shore line. The background is all low land and only in the neighborhood of Detour Point rises again in low hills.

At 3 o'clock we arrived at the west side of Drummonds Island and encamped in a protected place. All along the shore are numerous Niagara limestone blocks and boulders of dioritic and other rocks but no regular outcrop is noticed there. However going deeper backwards into the long bay with several small islands the flat rock ledges are seen spread over a wide area around the bay. There seems to have been a considerable military settlement judging from the numerous ruins of houses, cellars, barricades, graveyard estr. In the surface material of drifted limestone blocks some good Niagara fossils are found but the rock ledges exposed are only containing vestiges of them.

Wednesday July 19. Investigating the back ground of the bay as reported in the previous lines. About 10 o'clock A.M. Left harbor sailing along the coast in easterly direction. Took specimen from flat rock beds in the bay No. 92.

Wednesday July 19. The coastline is full of indentations and a number of little islands placed in front of them. The islands are generally covered by drift containing of course a large proportion of Niagara limestone besides dioritic and other boulders. We landed at one of the larger ones pointed out on the map by an inkmark. From there we entered the bay landing at another smaller island of the same drift surface. The large blocks of Niagara limestone strewn over it indicate the close neighborhood of this underlying rock. The shores are swampy, all covered with woods, no human improvements or habitations all the space along.

After having dined at the Island we sailed out and entered the next following Bay of larger size and put up our nights camp. The whole shore line of the bay consists of flat rock ledges and is only little elevated above the lake. Near our camp about a mile backwards from the entrance of the bay there are about 15 or 18 feet of rock strata exposed. At the waters edge inclined at a low angle towards the south are rock beds of about 8 or 10 inches thickness, containing besides Pentamerus casts and indistinct traces of Stromatopora and other corals. Very few fossils. The limestone is hard crystalline and very unhomogeneous having lighter and darker streaks and weathering by the action of the waves and atmospheric waters into a very rugged shape with numerous small pot holes all over the surface. The number of this stratum is 94.

Behind the shore line the slowly rising rock ledges are interrupted and form a perpendicular bluff of about 8 feet at the bottom of which some lower strata little differing from those above are visible. These are No. 93.

In a southwesterly direction there is on top of these ledges another abrupt embankment of rocks amounting to also about 7 or 8 feet. This rock contains a few more fossils than the former beds and is deposited in larger massive blocks 3 or 4 feet thick but the blocks are not solid or homogeneous enough to make a good building stone. The number of the rock specimen of the upper layer is 95.

Thursday July 20. At 7 o'clock we sailed out of the bay landing on the opposite promontory where the strata next higher in the series are well exposed along the coast. Specimens No. 96. The limestone is somewhat more impure with many silicious veins and nodes. It separates in uneven slabs only one or a few inches thick and contains a large number of silicified Stromatoporas, [illegible], Syringoporas, [illegible] and other fossils the upper layers being the most prolific. But the specimens are all more or less imperfect. In the Stromatoporas seldom the finer structure is perceptible.

We left this promontory and after crossing the bay we landed again where we found the same upper Niagara ledges well exposed over a large flat or little elevated land tongue. The fossils although quite abundant are rarely well preserved.

At noon we left this place. Again landed in another following bay but found the shore mostly composed of drift boulders of older rocks. Then we sailed for the next bay situated to the north of the range line 6. There are large rock exposures of the strata corresponding to the [illegible] almost entirely [illegible] casts and in the upper layers there are corals and [illegible] in great abundance, but very poorly preserved. In the drift [illegible] Favosites belonging to the still higher strata not exposed here are found. However all the fossils are more or less imperfect and partly destroyed by the silicification process.

At 4 o'clock we sailed out of this bay. Again the land tongue limiting it on the east side is mostly composed of drift. Still at the promontory are rock ledges cropping out. Also the higher ground in the bay we just left. In walking backward over the rock ledges which are about in the thickness of 20 feet exposed, one finds sand and drift boulder deposits forming the top of the low hills.

At 5 o'clock we arrived in the last bay on the south side of the Island close to the False Detour Channel. Large rock exposures all round the shore of the more massive dolomitic strata below the flaggy fossiliferous limestones. All this land is low. Densely wooded. The rock in large white crystalline blocks is however too much venose and traversed by cracks and cavernous spaces as to be of any superior qualification for building purposes. Rock specimens from bay on Range line 6 are numbered 97. Specimens from bay near False Detour Channel 98.

Friday July 21. Left port 6 o'clock sailing up False Detour Channel. The shore line remains low and presents no rock exposures of any import. Most of it has gravelly beaches containing numerous metamorphic rocks among its pebbles. About the neighborhood of Marblehead Point above the fishery considerable rock exposures present themselves in 3 terraces.

In the lowest beds near the shore there was once a quarry opened but the rock did not prove to stand the weather and the undertaking was abandoned. I made an accurate examination of the whole series of rocks exposed there, collecting specimens from every rock bed. Their numbers are from 99 to 113 which latter forms the uppermost strata on top of the third terrace. The section is as follows:

Lowest stratum No. 99. The layers appear cracked in irregular directions in consequence of exposure to the weather. About 2½ feet of them exposed, the lowest portion is 99.

Second stratum 100. 20 inches thick, separated in ledges of various thickness with even surfaces. (blocks of moderate size). Structure banded parallel to the stratification. Decaying by exposure to the weather falling into angular fragments.

101. 22 inches thick. Crystalline in structure and banded as No.100 with more or less impure streaks.

102. 20 inches thick. Rock characters nearly same as 101. Little less crystalline and the beds fissuring parallel to stratification into a number of subordinate layers from 1 to 4 inches in thickness.

105. 10 inches thick composed of several subordinate layers 1 or 2 inches thick. Structure crystalline and by weathering with porous cellular surface.

104. 30 inches thick. Exactly corresponding in appearance to 103 and separating in subordinate layers about 3 inches thick, but sometimes divided into much thinner layers.

103. 14 inches thick. Crystalline rock with considerable admixture of nodules and streaky portions of porous siliceous matter.

102. 54 inches thick. Beds separating into subordinate layers about 8 inches thick. Structure more earthy and absorbent than the strata below, of a dirty yellowish white.

101. 42 inches thick. Yellowish white, thick bedded, with earthy fracture and weathering or decaying readily into angular fragments.

100. 3 inches thick. Of coarse unhomogeneous structure and uneven surfaces of stratification.

99. 5 feet thick. Lower portions are composed of limestone beds with earthy fracture and similar on the whole to 107. Contains fossils among which are recognized favosites, cyathophylloid corals. Upwards it takes a rougher, more crystalline texture and appears mottled by numerous siliceous specks and is also fossiliferous.

The topmost portion is a highly crystalline tough limestone of a grey color with many silicious veins and a large number of fossils. For example, stromatopora, Cateripora, favosites, syringopora, Cyathophylloid corals, Chaetetes, crinoid stems and several other fossils demonstrating clearly that it belongs to the Niagara group. This bed forms the top of the quarries and is the summit of a terrace over which is spread a more or less thick bed of drift pebbles with fragments of higher rocks which form some distance back towards the point of the promontory a second and third brisk rock escarpment.

First the lowest strata seen in the 2t(second) escarpment 3 feet 6 inches well stratified xstall(crystalline) dolom(itic) limestone in beds of fr(om) 3 to 10 inches, apparently unfossiliferous. No. 110.

2t(Second) 111. Next rock mass in thickness 12 feet 8 inches form(ing) one solid mass with only faint indicat(ions) of the strata composing it. Rock contains, many silis(icous masses in only a part of which can fossils remaining(?) be discernably (?) traced by the decay of the silic(ious) part (or portions).

The rock is filled with numerous silex lined cavities having in general the rough outline of the fossil or nodule which disappeared. Among fossils recognized in the rock are principally very numerous casts of Lentumenus and quite an abundance of Stromatopora, several favosites. There are about 4 feet of thin limestone slabs on top of this crowning the terrace numbered 111.1

On the rear of this rises the third escarpment. The lowest stratum of the escarpment consists of thin very uneven bedded limestone of a finely crystalline structure and great brittleness. No. fossils observed. Numbered 112. This is only a continuation of 111.1 and the former may consequently receive the No. 112 also.

The upper stratum is 8 feet of a much coarser grained crystalline limestone in irregular beds and penetrated by an abundance of siliceous masses which help in the composition of fossil remains which however are partly calcareous and poorly preserved. The fossils very numerous. Those observed are principally again Lantanarus, Str matopora, several species of Favosites, Cyathophylloid corals, Syringopora, Fistulapora, crinoid remains, alveolites, Lacophalus, Strombodes pentagonus, Heliolites, Catenipora, actr. No. 113.

Saturday July 22. Sailed along the coast to Pirate Harbor. A splendid save(safe) place of resort. From there we went back along the coast to the spot where our yesterdays investigations ended. This is to say 1 mile from the landing made for the quarry. The strata from there to the point behind which pirate harbor is situated have a regular rise to that one following the coast. Comes gradually from the higher to the lower. Certainly there are depressions in the strata which many amount to 2 feet. But soon the strata rise again in the centre and lower strata appear from underneath. The section I begun with a stratum which I call Stromatopora bed and which is numbered 115. Above it I subsequently noticed a few feet of similar rock which is numbered 114 A and 114. Two samples or varieties. Section from above downwards:

114 A. A few feet of unhomogeneous dark colored bituminous limerock containing some stromatopora, Cyathophylloid and traces of other fossils not det(ermined) which are distinctly to be recognized as in situ under the rubbish of rocks fallen from above.

114. 3 feet thick of well stratified fine grained greyish limestone in moderately thick beds which however splits easily into numerous subordinate layers by weathering, or hammer stroke. The(y) contain what appears to be a Leperditia and some traces of other shells. These are however extremely scarce.

115. Immediately underneath are about 4 feet of a bituminous rock quite unhomogeneous and of nodular structure containing a large abundance of Stromatopora, some Cyathophylloids, Favosites, Catenipora and Orthaceras. The lowest bed of this strata is less bituminous and contains large blotches of white silicious matter. In one specimen I found Catenipora, Cyathophylloids and Favosites but as a general thing fossils are rare.

116. Below this comes a series of flaggy layers of variously coarser or finer gritty structure. The darker or lighter layers variously succeeding each other. The thickness about 6 feet.

117. Under this a stratum of inconsiderable thickness(several inches 9 or 10). Very uneven bedded rock with silicious blotches and fracturing under the hammer in numerous wedge-like splinters.

118. About 5 feet of a dark drab, tolerably pure limestone in beds from 4 to 6 inches thick and in some portions perforated by numerous acicular cavities formerly occupied by some crystalline substance.

119. About 8 feet of regular limestone beds separated in layers of various thickness and splitting in the line of stratification with a conchoidal surface. Color light yellowish-grey. Fracture earthy. In some layers are fossils found though not abundant, namely Leperditia, Rhynchonella, some bivalve shells, Favosites and some irregular fusses lined with calcspar or quartz.

this rock has the closest resemblance to the rock at the quarry at Marblehead and has also been worked a little in one place.

120. About 5 feet of thick bedded rock penetrated with numerous undulating seams colored with carbonaceous matter, parallel to the stratification structure. Unfossiliferous. Some strata contain irregular casts of Lasterocodes, also some Favosites occasionally and bivalves are found in it.

121. 5 feet of light drab colored absorbent limestone beds. Fracture earthy breaking in irregular rectangular pieces independent of stratification by the stroke of a hammer or by weathering. The lower beds are thicker than the upper half of the strata which latter splits in thin layers with very uneven surface and are also harder than the lower strata, ringing(ringing) under the hammer.

Immediately under it appears 120, whose uppermost strata of similar nature to 121 are marked by a great number of darker blotches comparable to fucoid remains. Below flaggy layers of limerock with earthy fracture and greyish color appear visible to the thickness of about 6 or 7 feet. Some contain Leperditia.

Sunday July 25. Finished the yesterday's section and sailed along the coast of the bay to Glencoe Point. The intermediate shore line is gravelly with a great proportion of older rocks in its boulders. Some hilly elevations rise in the background which doubtless expose on their slopes some of the strata of the lower half of Marblehead section. The land close (to) the shore is low cedar forest intermingled with a few birch trees &c.

At the east side of the point blue argillaceous and arenaceous marls are seen in the bottom of the lake and are thrown out on the beach. They contain a number of Chaetetes and other Bryozoa but in an entirely obliterated condition. A number of large slabs from 4 to 6 inches thick of a hard limestone with blotches of siliceous matter and little worm lay in great profusion along the shore. They contain Stromatopora and are probably not far above the marls of the Hudson River group in position but I could nowhere find an exposure .

Passing the point to the westward immediately the rocks disappear and the low shoreline is formed by drift deposits until arriving at the next following larger promontory. After having passed this bay where the arenaceous calcareous rockbeds of the Hudson River group are exposed in a long escarpment about 5 feet above the waters edge but visible in the lake bottom to the depth of 30 feet, the ledges are of a blue color and are stratified in thick rough tubular banks which slowly dip southeastwards.

They contain an immense number of Favistella stellata and another species besides Orthis lynx, Rynchonella increbescens, Orthoceras, Stromatocerium and numerous other fossils but all in very poor state of preservation. The formation of this locality contains much less argillaceous matter than the corresponding strata at Bay du Noquets. It is more a true limestone formation. Fossils and rock specimens are marked from this locality by the number 126. The blue argillaceous marly beds from the first landing place have the number 124 and the limestone slabs laying loose at the same place, supposed to be not far above this horizont have the number 123.

In the afternoon we left. Passed the point the following day. Did not show any rock exposures so we passed it and landed on a third promontory which again was lined with the calcareous rock banks of the Ludlow group containing the same profusion of fossils as the former locality. The Favistella in some places actually covers the surface. The exposures above the waterline are not over 8 feet. The beds form either perpendicular embankments towards the lake or each layer forms a large platform from which one steps higher to another tabular bed above and so on. The locality where we last landed and encamped is on the line of Town 43, Range 7 east, Sec. 30.

Under water are about 10 feet more of a similar rock seen on land. Turning the point of the promontory the west side again has no rock exposures.

Monday July 24. At the eastern end of the promontory in a continuation of the escarpment where we encamped are some more argillaceous thin nodular limestone banks exposed on the shore in a bluff 15 or 20 feet high. They appear to be lower strata than the beds at camping place. Contain few fossils. But the top layers corresponding to those of the former locality are all replenished with Favistella of good preservation.

Around the point on its west side no exposures seen, we consequently crossed over to Sulphur Island 2 miles right opposite from us. At the east end of the Island heavy bedded quartzites form a bold rocky shore line. The strata are inclined in a southwesterly direction at an angle of about 30 or 35 degrees. Big blocks 5 or 6 feet thick form the lower strata. Above are some thinner layers of from 3 feet to only a few inches thickness. This rock is fissured by numerous crevices of various dimensions, angular fragments of it partly filling them up, or rounded pebbles of the same material have been washed into them. Likewise the corners of the rock have been rounded by the action of the water at an earlier time than the era of the Trenton group.

These projecting rock beds are surrounded and partly enveloped by calcareo-arenaceous fossiliferous rocks. The limestone filled out all the crevices of the quartzites and cemented together the fragments and rounded pebbles partly replacing them.

The limestone beds are also inclined, their inclination depending from the external form of the quartzite nucleus from which the strata fall away in all directions at a more or less inclined angle. The lowest strata amounting to about 2 feet, separated in banks of moderate thickness are of a dark bluish or from weathering ferruginous color.

The calcareous mass is mixed with a considerable amount of sandy material. Fossils are in some layers quite abundant having preserved the external form pretty well. But in others esp. the finer structure is destroyed by their transformation into calcspar. Bryozoa and Cladopora form the most prominent features of the fauna besides an abundance of crinoid stems.

The land along the bay which is on the Canada Map represented as Indian river ground is a low marsh and presents no rock exposures whatever. The islands marked as belonging to the Clinton group are likewise not exhibiting any rock exposures. The inner cut out of which we landed is all covered by drift boulders with admixture of angular chips of an arenaceous limestone of dark, dirty yellow colors on the the outside brownish, on the inside it contains nummulets which may have been bryozoa but structure is lost.

On the mainland opposite at the point lining the second indenture on the north, there are rock fragments lining the shore which indicate a near outcrop. The rock specimens are numbered 133.

In the head of the little bay I can see rock ledges cropping out in the bank of the shore but only for a short distance. All the islands passed until reaching the south point lining the bay in which the river enters are apparently composed on the surface of drift material, no rock ledges being exposed. Also the shoreline of the bay is low, swampy and does not exhibit any rocks but a short distance behind the shore the land rises. Having passed the point of the river bay and after entering the bay north of quarry point for a short distance, scarcely half a mile the high land approaches the shore and exhibits a splendid rock escarpment which is disclosed by a large but abandoned quarry. The following section I made at this point.

Pencil diagram under the description.

Thickness of strata exposed in the quarry from top which is numbered 134 to solo bed to 143, amounting to 35 feet in all.

The top is formed by 15½ feet of even bedded limestone separating into banks of various thickness with straight linear division lines parallel to the stratification which by the influence of the weather occasion a splitting of the beds into a large number of secondary layers. The beds of this horizont are numbered 134 to 139.

135 is 4 feet below top.
136. 7 feet 2 inches below top
137. 9' below top
138 13'
139 15½

The next stratum 140, immediately under this is a bed of 30 inches thickness. It is of coarse crystalline dolomitic structure containing occasionally cyathophyll. This 30 inch bed however shows near the middle a seam of 4 inches thickness of darker color, thus dividing it into three layers, which by the action of the weather readily split into 3 subordinate layers.

141. Next lower layer 18 inches of limestone deposited in 3 banks of a tough somewhat crystalline texture similar to the layer above it.

142. Now follow below 5 feet of very even bedded limestone in banks about 12 inches thick or more. They are finely striated parallel to the lines of stratification and is inclined to readily split into even slab of the thinness of even a knife blade. This layer forms the bottom of the quarry stone which apparently furnishes the most beautiful quarry stones were it not that they readily decay and split into numerous layers.

145. Sole of the quarry is formed by dolomitic limestone beds of about 12 inches thickness. Below this the succeeding rock series are hidden by the talus and the debris of the quarry. The perpendicular distance from this stratum to the lake level is 15 or 16 feet.

146. About 20 steps to the south along the shore from the quarry landing at the water edge several layers of limestone slabs of a lower position are cropping out. Having observed the strata above the quarry later than the rest their numbers do not correspond with the series of the section but the uppermost takes the No. 145, and those 25 feet lower ones146.

Above the top of the quarry the hill rises about 35 feet higher. Top of hill exhibits a perpendicular escarpment of about 4 feet of coarse surged limestone beds containing Pentamerus.

After descending about 30 feet more in which descent there is no clear exposure of the rock to enter into a minute description of it, another escarpment of about 4 feet is met consisting of thin bedded limestone entirely similar to the top strata of the quarry.

Wednesday July 26. Sailed around quarry point. At that place are entirely similar rock escarpments as those previously described at the limekiln quarry. It is also an abandoned quarry here. The big bay extending there offers no peculiar interest for investigation so we sailed directly to the place where we first encamped on the southwest end of the island.

In order to make some additions in our collections of Niagara fossils, in going over the ground we made large collections. However nothing of very great beauty or anything else than the common fossils were found. The rock ledges containing them are nowhere clearly denuded but it is no doubt that the large fragments of it are close by their original location.

Thursday 27. We left the island on the forenoon and arrived at Point Detour about noon. Close by the landing on the elevated land behind the shore are several terraces of drift material indicating the former levels of the lake, which contain besides pebbles of older rocks waterworn pebbles of limestone and angular fragments of the rocks near by. The upper uneven bedded thin, somewhat argillaceous strata of which contain a great abundance of the finest preserved Niagara fossils.

Going backwards to the top of the hills one finds near (the) top widespread rockbeds slanting to the south of the massive dolomitic limestone in thick banks which besides cast of Pentamerus, Syringopora and a few Stromatoporas of little distinctness contains few fossils. The top is formed by huge loose blocks of the same nature.

In front of the slanting rocks at a somewhat lower level and intermingled with diorite and granite boulders are great accumulations of large slabs or lumps of the darker colored fossiliferous limestone.

Sometimes they are so regular that one is inclined to recognize the strata in regular position but generally they are irregularly torn up from their old resting places. Some strata of them are almost entirely composed of clift and these are preeminently rich in fossils particularly favositis and Cyathophylloids, Stromboder, ectr. The thickness of course under the circumstances can not be ascertained but it must be at all events more than five feet as reported in the geological report of 1862.

We spent Thursday and Friday exclusively to investigation and collection of a large number of fossils. And finding the place is enormously rich back from the more northerly situated second landing place we remained Saturday to increase and pack the stores of fossils we had accumulated.

Saturday 29. Expenses for boxes, bags, ectr. 3.50. For oxcarters 20 " 2.50. Among other things of interest I found a specimen of Favistella in the silicified Niagara strata behind the second landing for Fish, Milk, Butter ectr. 1.50
The whole way up the shore line for about 2 miles is very rich in fossils.

Sunday July 30. Morning excursion to the places visited yesterday at noon. Wind down the river quite fresh so we had to remain.

Monday July 31. Left Detour at six. Landed again at the third dock. Hillside very rocky with loose blocks belonging to the lowest numerous strata of the Niagara group. No fossils found in the same abundance as only ½ mile south in the continuationof the same terrace. Also the top of the hill is composed of the same loose blocks of Niagara limestone with some dioritic boulders. I went back to one of the places rich in fossils and collected a few large specimens of favosites and a cyathophylloid.

Farther up the mainland does not exhibit any point of particular interest. No rock exposures along shore which is low but rises into a hilly background.

The south end of St. Joseph Island is low, swampy. Lime Island likewise. Both are covered by drift accumulations. On Lime Island the southern portion has a great proportion of dioritic and granite boulders intermingled. On the north end which rises some higher the limerock fragments prevail. There are also a few old limekilns seen and from all appearances the Niagara rock ledges can not be far from the surface. The headland north of Round Island is all a swampy low land. So is the Anebish and the shore portion of St. Josephs Island. The high hills in the interior of St. Joseph are at least 5 or 6 miles remote from the coast.

At the settlement St. Joseph opposite Little Sailors Encampment Island there is an isolated bold hill apparently composing ledges of rock but on examination it is only a drift hill with large ashlar boulders and rock fragments or to speak more accurately fragments of whole strata comprising a series of subordinate layers.

These belong to the lower limestones seen at Sulphur Island and marked there as stratum second from below with the same fossils. In addition I found some specimens of Illaenus.

All the way along further north the land to the right and left is a low swamp without any exposures. We sailed on passing the low swampy north end of St. Joseph and encamped on one of the small Islands on the Canada side which are quartzite ledges elevated into bold rounded hills with the strata falling from the centre in every direction. The one on which we landed is about 50 feet high.

The surface of the rocks is everywhere smoothened by the action of the water and on some portions distinct grooves of the polishing action of the drift period are noticeable. The quartzite is generally white, has in some places a plain stratification, in others it is obscure. The fragments at the foot of the hills are mostly all rounded by the action of the water. Number of 3 quartzite specimens from the Island is 147. Specimens from St. Joseph marked 148.

Wednesday. For the coming season to get term plates of

F. 40 N... 33 at 34
41 N... 33 at 34
42 " 34
43 " 34 et 35
44 " 35

Missanabie River.

(Then follows several pages of pencil memorandum which had been copied and was typed in the preceding pages. Also two diagrams without description.)

C. Rominger, 1871 Descent of Escanaba from S.C.Smiths mine by Boat

First pages of note book were an expense account entirely in German which had been crossed out. Diagram of tent.

Molitor statement. A.V W. (A V Winchell ?) offered his notes on geology of his district if a certain sum is paid to him. In the same style as Grand Traverse region.

(Lansing house of Correction ?)
Distance 101 feet
Diam. hole 4½ "
179.4¼ sandrock
Balance of the boring 4 inch(?)

Clay mixed with gravel	36'
Sand and gravel	5'
Sandy hard pan	4'
Lake sand and gravel	39'
Clay sand and gravel	16'
Lake sand and gravel	1'
Soft sandrock	3'
Fire clay hard	4'
Soft white sandrock	13'
Soft sandy fireclay	15'
Close hard sandrock	119'

Hard fireclay intermixed with soft sandrock varying from 1 to 2' thickness, also variable in color from skyblue to white 64'.

Chert lime	1'
Grey lime	4'

Sandy fireclay intermixed with hard streaks 51'

Soft sandrock	37'
Hard grey lime	2'
Soft white sandrock	15'
Blue lime	1'
White fireclay	1'
Sandrock	4'

Mixture of fireclay and sulphuret of iron 50'

Soft sandrock	5'
Blue lime	16½'

Mackinaw House, John Becker. Mr. Lederle. Bromelard Bates. Recommended by A. Lederle. Do all you can for the Doctor. Will be up this week. A.L.

Before starting May 1. in Cash $148.25 plus 18.00 from Frau(wife) in Mackinaw
100.00 draft on Kanter.
Ditto 3 drafts of 100 each
Ditto 6 monthly money orders $100. each deposited with Mr. Kanter.
42.00 6
Sum der ausgaben(withdrawn) 1058, D(ate) Nov.5 1871
208.
900.
1108.

Expenses for state not noted in the receipt book.

Railroad fare to Detroit and back	Apr. 29	2.20
1 traveling box not paid yet		
Cooking utensils. See account		9.68
4# of coffee, Java		1.28
Fare to Detroit and transport of baggage		2.10
May 9. 50 cts carriage in a boat to a sailor		

A.A Humphries, Washington, Chief Engineer

75 miles from Point of Barques lighthouse to Thunder Bay island lighthouse.

22 from Sturgeon Point to Thunder Bay. 9o'clock opposite Sturgeon Pt. light.

3 pages of German with rough diagrams

Arrived at Manitou 3½ uhr(o'clock) Manitou South Island, southeast end. Embankment along shore from 4 to 5 feet limestone pebbles with few dioritic and granitic pebbles intermingled. Fine stratified sand from 8 to 10 feet, reddish grey compact clay beds, 4 feet exposed. About ½ mile further on the shoreline, the red clays are about 3 feet thick some pebbles intermingled. Below a thin stratun of calcareous pebbles and under it sand at least 12 feet thick.

Southside,in the notebook the hight of bluff overestimated. It is probably not over 80 feet. The clay bed is about 20 feet above the lake while on the southeast exposure it is only 2 feet above the water. In the south exposure instead of gravel fine sand overlies the clay bank. This sand is over 50 feet thick.

Point Seul Choix. Boat of Mr. Bromelow and Bates, every week once. Store of Mr. Newton at the same place .

Epoufettes - McCloud Mille Coquins - Will Matillean, Wm. Boucher Scott Pt. Fisheries. Leon Belanger (?) - Seul Choix O.B Newson, Henry Walker, Hew Dougherty, Lewis Metten. at Sand. (?)

Mouth of river about two miles west of Hughes Point belongs to Mr. Bates. Accurate investigation.

Monday 22. 8Uhr(o'clock) In Mackinaw
On Bromelow and Bates 70 dollars deposit. Ed. Gibbins, woodsman, Mich.McCarty, sailor.

Wednesday 24. Sailed out with good wind from fishery towards Epoufettes.Indians report iron ore. Gibbins tells me that a few miles back from shore limestone occasionally crops out. The sand hill dont extend far back. In one hour we sailed to the point Epoufettes. The sand hills recede from the point and leave it a low spur covered with rock boulders. On landing I found the Niagara rock beds finely exposed with numerous but little distinct fossils. Winchell had his name engraved on a rock. Left the point 10 min. after 8 o'clock. Land far along shore all low. Shore apparently gravelly. Timber mixed. No settlements of any kind all the way from Blanchards except fisheries.

Paragraph in German

Monday 29. Left Manistique Saw mills transporting our baggage on wagon to the mouth of Indian river into Manistique. Here we took canoe and paddled up river. Both sides are sandy shores with mi xed wood. Sometimes nice beech and maple growth, sometimes pine, balsam cedar and hemlock.

Further down the river are rapids with rock ledges. On the banks are the strata exposed which form the top of the quarry east of mills. Banks of river about 5 feet above water. River large, deep, about 150 feet wide.

Where the river bends north from itd western course, the land is somewhat lower, mixed, while before the land on northside was beautiful maple growth. Elevation above water still about 4 feet or 5. About $\frac{3}{4}$ of a mile upwards after the river took a northerly direction rock came out on the bottom and from small rapids about 200 yards long.

Timber land middling good pine to the right, maple to the left. Shore itself remains sandy. Not far above the river takes a turn to the west and quite a strong current sets in. Maple on the right now, pine on the left, river making small turns where the creek comes in from the north. There is some swampy land up towards the turn(?) of the creek along the easterly turn of principal river. Mixed timber land remains fair. The river is deep and still about 150 feet wide.

At the corner where the river makes a southerly turn not far from the entrance of the creek under 4 feet of sand, crops out a few feet of dark colored stratified clay which contains a number of vegetable remains and unios, the calcareous shell all removed and only a carbonaceous crust indicating the shape of the shell. A road runs right along the shore on the north side.

The river makes a great many curves and it is not easy to keep himself (one's self) oriented for the whole distance. Until $4\frac{1}{2}$ o'clock the character of the banks and the timber remains the same. Occasionally clay banks crop out. At(and) once the banks of the river rise to the hight of 50 feet on left side, above sand, the lower ten feet a red hard clay with many dioritic and granitic pebbles and boulders inclosed. This high bank holds only on for $\frac{1}{2}$ a mile, then the land is as before. Further on the red clays with pebbles are several times exposed.

Tuesday May 30. After being tormented all previous night by mosquitoes we followed the endless meanders of the river. After about 2 hours row we arrived at the entrance of the northwest branch at $8\frac{1}{2}$ A.M. Both sides of river are hardwood land of about the same character as all the way up. It seems that some distance back from the banks the land gets lower.

The northwest branch we entered has a strong current so as to make oars useless. At noon we stopped Township 42, Range 15 Sec.2 on the rivers bank. Pine is there the prevalent growth.

Wednesday May 31. Returned from excursion in yesterdays camp, At 3 O'clock. Left down creek at $3\frac{1}{2}$. Took us $5\frac{1}{2}$ hours to come down to Manistique river fork where after an encampment (Thurs, June 1) in a river bank and great torment by mosquitoes, in the morning we arrived $\frac{1}{2}$ past 6. Went up principal stream which is on both sides lined with beautiful hardwood timber land. Banks are clayey, sand below, at waters edge frequently the red clays with pebbles crop out. The pebbles there are of peculiar character and seem to be derived from Hudson River group, still no fossils seen in them.

Went further on the river looking for the outlet of stream running from a lake but all outlets are much smaller than I supposed from the map. Passed it looked out for limestone ledges but could not succeed finding them. At noon we stopped in Town 24, Sec. 14 where the river touches the line between Sec 7 and 6. At that place the bank is 40 feet high at the waters edge. About 6 feet of a light gray tenacious clay crop out under 30 feet of sand. The timber land there on the left hand side going up is for a long distance open being burnt out sometime ago. On the righthand is mixed timber.

Proceeded to the bend of the river in Township 43, Range 14, Sec. 32 and tried to navigate up the small creek but found it impossible to get up it, being obstructed by timber and beaver dams, so we returned and encamped there. Terrible night. A thunderstorm made me expect relief from the mosquitoes but it made them still worse face and eyes all swollen.

Friday June 2, 3 o'clock morning waiting for the men to get up. Without success. For the day is proposed an excursion due east on the township line to the lake in Sec. 32 and 33, Town 43, Range 13, where there is reported to be an excellent locality for iron ore.

At 6 we started out back from the river bank which is about 15 feet high. The land lies(lines) some(come) into a low ditch, from this about $\frac{3}{4}$ of a mile back a limestone ridge with fine hardwood rise to the hight of about 50 feet. The township line between Town 43 and 42, Sec. 33 and 34 lays right on top of the ridge. The little river running east is surrounded on both sides bya large tamarack swamp through which I traveled unto Sec. 36, Town 43, R. 14.

The soil of this swamp is boggy, the subsoil sandy and no trace of iron. After much fatigue and exertion I returned 2 o'clock afternoon and proceeded up the river. The limestone indicated on the maps further down the river is an immediate continuation of the ridge bank there. The sand soil forming the river banks contains a good deal of clay and is apparently fertile from the kind of timber that grows on it.

Saturday June 3. Started $\frac{1}{2}$ 6 uhr(6:30) Mosquitoes awful. Character of the land not changing. All hardwood proceeded to the second river branching off from left hand side. Gibbins sent for(to) the locality marked bog iron on survey map. Saw a bear with two young ones crossing the river. Land around the river all low upland but only a seam of it while frequently behind the bank swamps begin.

Soil continually sandy with admixture of more or less loam. No rocks seen but large comparatively little altered trees stand out of the river bank and prove that part of it is of very recent origin, while there are trees growing on it which are at least 100 years old.

Diagram

Gibbins sent out along the creek as indicated on map brought back specimens of bog iron ore which forms in magnificent lumps around the roots of fallen trees but no deposit of any extent is to be seen, and most of the extensive swamp has merely Turf(tuff) ground and no iron. When we tried to continue our journey we found a $\frac{1}{2}$ mile on the river perfectly obstructed by timber and had to return.

Sunday June 4. Set out for return about 5 o'clock in the morning. In going down, observing the recent origin of the banks of river almost everywhere verified the limestone ledges laid down on town maps. The land of the surface most everywhere more or less impregnated with iron and hardened to a kind of friable sandstone. Sandy clay strata of blackish color with vegetable remains cropping out under the sand of quite recent origin but near the lower fork of Manistique river, reddish gray clays with diorite and limestone pebbles of drift age. Specimens of ferruginous hardened sand collected. And from a clay bank under the sand bluff in Town 42,R.14, southeast quarter section No.6 some specimens are preserved Limerock of Sec.7, in the same town marked 11.

Specimens of reddish gray hard clay with many pebbles dioritic, granite,Niag.limest and probably some older greenish looking limestones is exposed in 3 or 4 localities above the fork of Manistique on principal river. Then below fork in several places it is in one place visibly 10 feet thick and perhaps continues below the waters surface some depth because the water becomes at once precipitously deep. The sand here overlaying it dont here seem to belong to the same period but to much later date. The clay joins it with a very uneven undulating surface.

Diagram of above.

Monday June 5. Started downwards at 5 o'clock. Noticed the drift clays with pebbles of Niagara limestone, diorite and granite and peat deposits of several feet thickness, Between the sand strata thinning out sometimes to a small seam or thickening in some places, it is almost only vegetable matter, in others it is a clay mixed with fine sand and vegetable matter.

To my estimation, about 2 miles above the embouchure of Indian River, flat slabs with uneven surface belonging to Niagara group crop out in the bank of the river in a low level country only covered by thin sand layers. No fossils noticed in it. A little farther down the whole river runs over Niagara limestone and forms a sort of rapids but on the banks no rock is exposed. They consist of sand. Rapids come in again a few hundred yards below. Specimen No.2 from this place. No.1 is of the place above. Difference in level between the two about 5 feet or over.

The limestone beds in Manistique River extend out to the lake and are 42 feet thick. Below this there is clay bottom counted from the strata at the mill. 11 feet of water in the entrance of the river instead of representation being 7 feet deep only. 20 feet from bedrock of river below dam up to the first rapids above dam.

1. Lowest strata even with waters edge bluish crystalline spotted. Under it shall be a continuation of rock strata for 42 feet.
2. 2 feet of crystalline limerock with many indistinct Stromatopora with Pentamerus oblong. , Favosites wavelines.
3. 4 feet of a hard bluish limestone splitting in uneven slabs with fucoid stems on surface and also of form candagalli, encrinite stems, 1 Trilobite tail, Pentamerus, Fenestella weathering white. Looks then meagre, earthy on surface.

Manistique 2.25 cts. 6uhr(o'clock)

Wednesday 7. Morning 4½ o'clock left Manistique. From mouth 1½ miles west coast sandy, at the following small point pebbly. All quite low land with small mixed timber.

At the point the rock ledges come out at the level of the water and are hard thin uneven slabs with scarcely any petrefactions. Here and there a Pentamerus. They are evidently the same as the upper strata under the mill dam in Manistique river. At the other points gravelly fragments of the same rock are also seen but no outcropping rock. The indentures are sandy beaches. The land is low with small pine and cedar timber. On it many small creeks with clear cold water come out along the beach, which proves that the whole district is underlaid by the limerock strata at no great depth from the surface. The 4th point we reached after leaving Manistique exhibits rock ledges at the bottom of lake.

Thursday 8. After passing Pt. of Barques a large bay opens. The next largely projecting promontory which is scarcely 1 foot elevated above the water consists of horizontal ledges of Niagara limestone containing very few fossils and apparently identical with the ledges exposed at Epoufettes and Seul Choix. The whole coast land further on is little elevated above water and does not exhibit any interesting exposures unto the 6th promontory from Pt. of Barques the latter included.

There about 10 feet of slabs of Niagara limestone are exposed. The upper 5 feet are almost destitute of fossils only containing Pentamerus. The lower 5 feet are somewhat argillaceous and silicious and contain a very great many fossils but the structure of the corals is obliterated and generally only the outlines of the form well enough preserved. All the specimens from this place are marked 24. All the land along shore little elevated. Generally small young timber of mixed kind. The strata slightly fall away from the point towards the lake. N.B. By mistake some of the specimens the other side of Pt. of Barques are also marked 24 instead of 23.

Promontories at Pt. DeTour rocky. Rock in some places not projecting over a foot above water. In others about 7 feet of rocks are forming a brisk escarpment. The rock is a crystalline limestone with very few fossils except faint indications of large masses of Stromatopora and some large masses of a Syringopora. The specimens from that(this) place have the number 25.

On Big Summer Island opposite our camping place is a small bay in which the Niagara rocks protrude perhaps double the hight than at Point DeTour. The rest of course does on this side ~~not~~ appear rocky in several other places. Big and Little Summer Island are densely covered with mixed timber. Elevation where highest apparently not over 40 or 50 feet.

Town 44 N. R. 18 W. near corner of 2,3,10,11.
Taquamenon in Town 47 N, R. 9 W. Sec. 16 and 17 near quarter post.
Corner of Town 44 and 45 North and 14 and 15 West, Central position of bog iron deposits.

Martins Island seen to**the** south is evidently higher elevated. Little Summer Island is clean leafwood timber, birch and **poplar.** High rock bluffs on the Point beyond Eliots harbor, strata dipping little downwards the bay. First rock escarpments about 15 feet high, then 30, then 60 or 70. At the upper end of Promontory finally 100 feet.

Diagram of above.

The lower banks are regular even strata without any visible petrefactions and about the same lithological character in 50 feet thickness.

The rock is very brittle and cracks in splinters. The upper 50 feet which evidently are Niagara limestone according to the fossils contained in the pieces fallen down are of various more or less crystalline structure, not even bedded, sometimes deposited in thick bulky masses sometimes in uneven thin slabby layers. The line between the Niagara and supposed Clinton group is not accessible and also hidden by talus.

The promontory beyond the furnace forms again a perpendicular escarpment of about 40 feet which entirely belongs to the lower strata with even stratification. In the bay between sandy beach.

The promontory at the south of Garden Bay consists also at the waters edge and about 20 feet upwards of the even bedded limestones supposed to be Clinton group. The lowest strata is very crystalline in structure. A few other specimens brownish mottled I picked up at the escarpment but do not know the exact position. Also a specimen being an indistinct Stromatopora. All these are numbered 28.

Crossed over to Sturgeon River bay. Very rough. River flowing out of a perfectly flat sandy country. At the promontory north of mouth of river, limestone strata equal to the Clinton strata of the other side are cropping out in low water but are now not visible. River has 3 rapids. 1 at 10 miles distance up, one at 14 miles and one at 27 miles. The river is so tortuous that I am informed its length at 14 miles distance in straight line amounts to 50 miles.

In the afternoon I went up the supply road along the river about 7 miles and found the river at that place about 18 feet below the high embankment which above consists like the surface of the whole country of sand, thickness about 10 feet. Under the sand are about 4 or 5 feet of a very fine well stratified rose colored tenacious clay. Under the clay is a layer of mostly calcareous pebbles exactly alike those at Manistique river; and under the pebbles are very large thick slabs of a greenish rough sandy limestone of which I also saw a number of smaller fragments among the pebbles of Manistique river. The slabs are flat, spread out over the bottom of river but I am not yet perfectly satisfied if they are in natural position or only boulders. The limestone is at any rate peculiar. The specimen numbered 29 is a representative. Had a rainy night without tent.

Saturday June 10. 2 or 3 miles further up I struck the first rapids. There is an exposure of about 6 or 8 feet of ledges which form the bed of the river and crop out at the side. It is a bluish green, sandy and argillaceous limestone with few fossils. The most common is a sort of Cyathophyllum with branching stems. I saw also a few ribs of Isoteles and Leptaena, some crinoid stems.

Four miles higher up the bed of the river consists of flat rock ledges of the same character and immediately in contact over it are the rose colored clays exposed.

Fourteen miles higher up shall be other rapids but to travel that distance with no prospect but to see a continuation of the same strata detained me from going further. A laborer which however was not there himself tells me that about 30 miles back the land rises considerably into high rocky hills as the trappers and lumber men report him. The supply road goes 30 miles back .