At the same time the cavities in the amygdaloidal rock gradually filled with calcspar and laumonite, less common with quartz prehnite and epidote. The admixture of epidotic masses with the amygdaloid belt is sometimes evidently an admixture of epidotic rock masses already formed. Sometimes however the epidotic rock might be the result of layer metamorphic processes in which instances the epidotic blocks in their periphery insensibly merge into the surrounding brown amygdaloidal rock substance.

In parts of the amygdaloid belt its stratified nature is very plain. Elsewhere the amygdaloidal masses are mingled with the trap in bulky pockets and smaller lenticular seams. There are frequent transitions from the compact trap in the amygdaloidal condition but these amygdules are generally delessitic and not sparry or laumonitic. Sometimes a large portion of the amygdaloid belt is not brecciated and consists of brown amygdaloid with abundant spar, laumonite and epidote amygdules in a large uniform belt.

Diagram.

Sunday July 13. No particular work done. Made acquaintance with a number of scholars from Columbia,College, N.Y. and Washington College, St. Louis. Evening and nearly all night suffered severe toothache.

Monday July 14. Cloudy cold weather. Went in the forenoon to Pewabic and Franklin mines. Afternoon over the hills on south side of Houghton. The trap belts exposed there are on the surface rapidly decomposing. The augitic constituent changes hereby in an earthy hematite colored substance, Often very coarsely crystalline seams are inclosed by the much finer grained trap. Also epidotic patches are frequently seen within which in their circumference merge with the ordinary trap without a line of demarkation. I am therefore inclined to consider the epidotic masses as the result of a paramorphosis of the trap by means of aqueous solvents in the same way as the cement mass of conglomerate rocks found there is changed into epidote.

Tuesday July 15. Went with St. Louis students to the sandstone exposures in Swede Creek. Had tooth pulled.

Wednesday July 16. Went to Summit Station 8 miles from LeAnse. This part of the mountains is altogether composed of well laminated often considerably corrugated beds of a gneiss which is intersected by dykes of reddish colored granite. Dip N.E. Going down towards LeAnse the gneiss disappears under the drift which is full of blue colored blocks of compact arenaceo-argillitic beds of the slaterock formation. In several cuts of the railroad this blue rock approaching in some layers a slate structure is exposed dipping under high angle southward. An outcrop of ths kind is not far from the 57 mile stone (in miles 56).

Thence to Taylor mine station on 58 mile post no more rock exposures. 59½ miles and 200 steps to the east of the road a prominent rock bluff is visible which consists of a large belt of diabase striking east and west in contact with a coarse breccia of arenaceous rock mingled with angular fragments, of white quartz and some of granite. Next above are well laminated altered arenaceous rocks dipping under a high angle south, and further east in the strike of these rock bluffs blue slate rocks dipping south are found exposed.

Diagram

The blue arenaceous slaterock is also exposed in a cut of the railroad at 59¼ mile from Marquette. At the 61 mile post trenches are opened in which a good roofing slate is exposed close under the surface, dip south under an angle not exceeding 35°. From here down to LeAnse the slate is everywhere close under the surface and is exposed in the creek bed to the left of the road. The thickness of this slaty series and more compact arenaceous rock is very great but there is no occasion to make an estimate of its real thickness.

Thursday July 17. Cold rainy day.

Friday July 18. To Calumet . R.R. fare and return $1.30. Specimens from Isler $1.50, analcim 25cts. Met Capt. Hodson, learned from him - the cross cut begins about 100 feet from shaft No. 4 of the Hecla at the 9th level, each level counted 93 feet or 60 feet perpendicular. Next above the conglomerate belt is an amygdaloid of dark greenish color which sometimes contains quite rich pockets of copper. Above it is black trap also full of seams of sheet copper and disseminated with fine molecules of copper. Likewise at the base of the conglomerate an amygdaloid occurs which occasionally is rich in copper. The specimens of amygdaloid which I collected last year at the mine are most likely from this footwall and not from the hanging.

Sunday July 20. Sheldon and Columbian mine on Portage vein. Portage part Isle Royal 200 feet east of Portage. Huron mine on Isle Royal belt. Fissure vein with Whitneyite opened east of both.

Monday July 21. Hotel bill $27.50. To Calumet 70 cts. Baggage transport 25 cts. Arrive at Delaware mine.

Tuesday July 22. Hired Schmitt and his son for the trip to Mt.Houghton. Went with Mr. Palmer on engine to Lake LaBelle Stamp Mills. General dip of beds at the mine from 22 to 33°.

Tuesday July 22. Mr. Palmer agent of conglomerate mine took me down to Lake La Belle on the engine stopping at every place where rock was exposed along the line of the road. Most of the surface is covered with drift but several belts of amygdaloid and of massive trap were denuded on the first 2 miles. At the place where the rail road intersects the wagon road a conglomerate belt 150 feet wide in horizontal measurement occurs. The conglomerate contains much more trappean and amygdaloidal pebbles than the Delaware conglomerate. The dip is conformable with the entire group, northward under an angle of about 22 to 25 degrees.

The cement is largely impregnated with epidote, otherwise of dark color. Farther on a coarsely brecciated rock belt resembling some of the brecciated amygdaloid belts in the Portage lake district is cut through by the road. Still farther after interruption of the exposures other trap and amygdaloid belts become visible. The rocks are copiously mingled with epidotic rock.

Before descending to the lake such an epidotic trap belt in which the epidotic seams are brecciated mingled with spar and red feldspar seams has been laid open by a larger cut.

Below amygdaloidal and trappean belts follow, which at the mill are underlaid by a dark conglomerate belt over 90 feet in thickness. It disappears with its base in the lake and its lateral extension is visible for about the space ½ a mile wide. It like the former conglomerate has a composition of trappean and amygdaloidal nature besides the porphyritic pebbles, also epidote makes part of the cement. Some well stratified seams of a fine grained rock interlaminated with the conglomeratic part which resemble the jaspery rocks exposed on the shore east of Montreal River. Mr. Palmer tells me he had the conglomerate analyzed and found 17% of iron oxid in it. Got the promise of a boat for tomorrow from the overseer of the stamp works. All the strata seen invariably dip to the north. Provisions $5.50

Wednesday July 23. Left Stamp Mill docks about 9 in the morning with Schmitt and his boy. Seams of spar and laumonite intersect trap in lake bottom. Dip S.E. in frequent instances. Other times not determinable.

Diagram of above.

Leaving the canal of Lake LaBelle the shore is for some distance lined with a sand beach. Then at the foot of Mount Houghton large red colored brecciated rock masses and conglomeratic belts project on the shore in high bluffs. In the lake bed white and red striped Silurian sandstones can be seen. Farther on, trap rocks all in a shattered and brecciated condition brown colored and partly amygdaloidal are exposed. Many spar and laumonite seams intersect them in all directions. Sometimes also greenish diabase with birdseye structure crop out in association with the red colored trap, full of cleavage cracks which make it difficult to determine which way they dip. Sometimes a northern dip is plainly discernable but also often a dip to the southeast occurs.

High vertical bluffs rise in the background as we enter from Range 29 across the town line into Range 28. There are with the brecciated trap and birdseye diabase connected immense masses of a bright red, obscurely stratified and always shattered and brecciated. Rock bluffs rising nearly 200 feet vertically are entirely composed of this rock. Further east on the shore a large body of Silurian sandstone sets in at the shore and its discordant contact with red brecciated trap rocks is well exposed in the shallow water near the shore.

Further on unto the mouth of Montreal River Trappean rocks line the shore. Brecciated and conglomeratic seams are frequently alternating with greenish trap beds of birdseye structure, all of them intersected by a dense network of larger and smaller seams of spar and laumonite. The dip of the rock near Montreal river is north. Montreal River leaps over the birdseye trap ledges into the lake.

Thursday July 24. Morning at 5, thunder with some rain. Lake quiet. Intend to go with boat eastward along shore to the place where I struck into the woods last year on the line between Sec. 35 and 36, T. 58, R. 28. Point east of river, brecciated trap, dip north, consist of brown amorphous seams cementing the trap fragments and mingling with their substance likewise epidotic rock masses abundantly intermingled and almost everywhere laumonitic and spar seams traversing the rock. Further on the same rock confines(contains) in places large masses of an amygdaloidal conglomerate rock are inclosed between the trap which itself is in a broken shattered and recemented masses.

On the mouth of a little river in S W.¼ of S.W.¼ of Sec. 26 a mass of red porphyry showing scarcely signs of stratification and full of cleavage cracks borders the shore which dips as it disappears under the before mentioned trap beds close by. On the opposite eastern side of this bay with fisher huts the entire landspur is found of such porphyry. The dip of the strata appears to be to the southeast but it is hard to determine. Position of ledges (beds), steep, often almost vertical if the lines of segregation of the beds corresponds with the stratification. I find some portions of the rock in brecciated condition others not, cleavage very irregular.

On the north side or also further east on the shore trap rocks are in contact with the porphyry which are full of red or also greenish plagioclas crystals of large size. With these coarsely crystalline rocks fine grained seams of trap are associated. These trap rocks form the point on line between Sec. 35 and 36. T.58, R. 23.

Montreal River bend. Lowest brecciated trap with brown seams and amygdaloid fragments. 2. Massive trap with quartz and chalcedony nodules, 5 feet. 3. Brecciated amygdaloid, 4 feet. 4. Fine grained trap with birdseye structure. 5 Brecciated amygdaloid as the former. 6. Fine grained trap top of hill. Below the bend are other lower beds exposed several amygdaloid belts. Among them the compact trap beds have most a fine grain and birdseye structure.

Friday July 25. To Clark mine by trail. Past the bend of Montreal River, north of the yesterday mentioned trap belt No. 6, other fine grained trap beds and then a brecciated trap belt are seen exposed. Then near the north line of Sec. 27 a high broad ridge is crossed which consists of a porphyritic breccia and conglomerate, part of the pebbles being worn, part angular. Some amygdaloid pebbles and trap pebbles mingled with the porphyritic. A part of this conglomerate rock about 800 feet thick and dipping under high angle to the north is in seemingly little brecciated regular well laminated layers resembling the porphyritic rocks on the shore.

Farther on about ½ mile in low land a knob of trap is passed by the trail which thence approaches the river and crosses its branch on the east side of a triangular small lake. The trail winds from there northwest over some hills of trap but most over a drift covered undulating surface until the river is struck again, near the saw mill of the Girard mine. Collected there a specimen of trap at the dam in river.

From there the road follows the river for a half mile and crosses it then at the foot of another lumbermens dam, where compact trap belt and an overlying amygdaloid is exposed. After crossing Montreal River the road goes north to the Star mine. Ascending, a good many belts of trap and intervening amygdaloids are crossed. Several of the amygdaloids are cupriferous and have been mined at the Star. Higher up near the greenstone bluffs the Star mine worked a fissure vein.

Under the greenstone bluffs the Allouez conglomerate likewise cupriferous has been opened in mining pits. A trail leads from the Star mine over the greenstone ridge which is formed of a large succession of different qualities of trap as in the Eagle River section.

Then we came to the Clark mine worked in a fissure vein intersecting the greenstone. Further north on that location several amygdaloid belts have been opened by mining pits and shafts.

Further north the so-called east fissure vein is followed by an adit into the hill. The vein can be plainly seen exposed on the surface intersecting a blackish fine grained trap. Then an amygdaloid belt and finally it can be followed to the great conglomerate belt of Copper Harbor. In the conglomerate the vein loses its metalliferous character and is mainly a spar vein. In the amygdaloid the vein is rich in copper and spar, datolith and zeolites are found in fine crystals.

Spar north of No. 6 from yesterdays collection, 2 compact fine grained specimens. Trap, wide belt, brecciated trap above. Then 4 specimens from a large conglomerate belt intersected by the river, not less than 800 feet thick. 1 specimen trap knob on trail to the Girard mine, south of 3, angular lake ½ mile. 1 specimen from S.W.¼ of N.W.¼ of Sec. 23, T. 58, R. 28. 1 specimen from sawmill on dam of Girard location. 1 specimen from dam where road to the Star crosses the river. 1 specimen on road from Star mine to the river. 1 specimen amygdaloid from lowest adit of Star mine. 1 specimen of boulder on roadside. 1 specimen from Clark mine on greenstone range.

Saturday July 26. Fine weather. Rowed back along shore. From mouth of Montreal to the point on centre of Sec. 28. With exception of a small gravel beach all the shore line is formed by trap, most greenish dark color with birdseye structure or also of reddish brown color and in a brecciated condition. Also the green trap is often brecciated and fissure seams of spar and laumonite form a dense network of narrow linear seams through these rock masses. Often also a seam of this kind widens to one and several feet diameter.

Also amygdaloidal seams occur in this succession. In particular I mention a conglomerate composed of rounded amygdaloid boulders exclusively which are cemented by a brown ferrugineo-silicious mass of fine grain with smooth but dull earthy fracture. The same mass forms also the cement of the large brecciated trap masses of which this amygdaloid conglomerate is a local modification.

In centre of Sec. 29 horizontal sandstone, then brecciated trap brown and green full of seams, also large amygdaloidal belt, dip north. North of them high cliffs of brecciated porphyry which overlies the former. The beds on trap immediately incumbent and partly well laminated on line between 29 and 30, dip northeast.

Diagram

At that point large masses of conglomerate lay on the trap which probably are not in place but the trap has also a very near conglomerate structure at that point and the conglomerate may in places make a part of it. Red brecciated and conglomerate trap continues on west side for nearly a mile off the point also the greenish birdseye rock locally mixes in, then gravel beach round the creek on west end of town stripe.

On west side of creek brecciated brown trap againmingled with the green birdseye rock and various amygdaloids. Also blocks of porphyry like nature enter the mixture. See specimens, from east side of township 58, R. 29. All further outcrops westward the same brecciated traprocks. Dip north under angle of about 50 degrees, towards the end of the trap bluffs. The inconformable contact of the sandstone in the bottom of lake is most beautifully seen. The sandstone forms there a portion of the shore. Further on a few trap beds come out again, then sandrock again, the trap dark green of birdseye structure, full of spar and laumonite seams.

Diagram.

Landed on sand beach near entry to Lake LaBelle and camped. After dinner went east on shore which from camp for ¼ mile is lined with coarse boulders and drift embankments. Then a large series of sandstones and brecciated strata of dark brownish red iron color rise under an angle of 30 or 35 degrees from the lake bottom and form the shore line for a distance of about 300 or 400 steps. The sandrock is evidently corresponding in character with Silurian sandstones partly white, partly red colored and ripple marked. Its strike is from E. to W. its dip south.

Further east the birdseye trap in a shattered seamy condition forms the substratum of these sandstones and its dipis clearly to the northeast. The sandstones of Silurian age must have been underwashed and consequently glided into their present inclined position. The sandstones further east in Town 28 are also locally dipping south tut the greater part of the exposed beds lies horizontal.

Sunday July 27. Bright clear day . Went to Mount Houghton after breakfast. After some unsuccessful efforts to find the top we finally succeeded. The Lakes Survey has built a station there from which a magnificent view over the country is to be had in all directions. Otherwise the forest hinders the sight. The top of the Hill is formed by a very wide belt of porphyry which shows distinct lamination. Dips under high angle to the north. Coming down I came unto vertical walls of the porphyry which can be observed from a distance out in the lake. South and underlying this porphyry is a fine grained trap exposed on the slope. Farther down no outcrops can be seen. Returned to camp at one o'clock.

Examined in the afternoon the different boulders on the lake shore and collected a good many specimens. After our return Mrs. Streeter from the Delaware mine came in a boat to see us but did not stay longer than half an hour then returned.

Monday July 28. Returned to Lake LaBelle. Examined the Mendota hill. The base of hills at Lake LaBelle settlement is formed of a large conglomerate belt of peculiar kind which carries a little copper. Above a fine grained trap mingled with epidote masses and in shattered partly brecciated condition follows. Higher on Mendota hill compact dark grey colored trap resembling the dark rock of the greenstone range of birdseye structure. Still higher the so-called syenite belt follows which in part is almost exclusively composed of red feldspar . The thickness of this belt is several hundred feet. Above it a dark grey compact diabase with lustre mottling succeeds. Also this belt is very large, forms the top part of the mountain.

In the higher part of the south slope of the mountains a spar vein carrying some chalcocite has been extensively mined by the Mendota Co. but the mining proved to be a failure. This vein intersects the so-called syenite. Farther back on the plateau of the mountain various trap and amygdaloid belts and then a large conglomerate belt are intersected by the same vein. Returned in the evening to Delaware. 6 days ~~at~~ $2. 2 men at $4. $24.00. Boat 6 days $3.00.

Tuesday July 29. Went to Copper Falls. Returned to Delaware in the evening. Packed 2 boxes with specimens. $1.00 stage fare.

Wednesday July 30. Left for Houghton with stage. Paid 3½ days hotel bill. Stopped on road at the Cliff mine and remained as guest of Mr. Brockway to Thursday July 31. Mr. Brockway brought me to his exploring shafts and branches on the north cliff where he opened several fissure veins carrying more or less copper. (brecciated amygdaloid about 200 feet north of ash bed).

In going there I observed the alternation of amygdaloidal massive trap belts to be much greater and more diversified than I formerly knew. Among these belts I mention a brecciated amygdaloid belt about 50 feet wide situated about 200 feet above the ash bed which consists of rounded boulders of an extremely hard amygdaloid cemented together by broad seams of a brownish fine grained interstitial mass. This rock crops out in a short ridge which resists erosion better than the surrounding trap beds.

Diagram.

Another amygdaloid belt of brecciated character is in a soft brittle condition of brown matrix with light red and whitish colored amygdules is uncovered in the ditches north of the ash bed, which same amygdaloid I found in the abandoned mining pits on the road from Copper Falls to the Central. Above it is a dark blackish, easily decomposing trap of which a specimen is in the collection. The veins are traced from the north side of the ash bed to a considerable distance south of it, whereby a number of these amygdaloidal rock seams became uncovered which on the surface are not observable.

Thursday July 31. At 10 left for Houghton. Took dinner at Calumet. Stage and dinner $2.60. Arrived 4 o'clock at Houghton.

Friday Aug. 1. Examined the trenches dug by the city for the pipes of waterworks. The trench runs almost parallel with the strike of the formation beginning at the bridge. Going up the hill various trap and amygdaloid belts are intersected. Then comes a sandrock and conglomerate belt about 20 feet thick, then trap and amygdaloid belts again. Farther on about 100 or more feet from the conglomerate belt another conglomerate belt of about the same size follows in descending order. This belt is the same as mentioned before as outcropping west of the schoolhouse. It is epidotic, the first not. The amygdaloids intersected show traces of copper but cannot be called cupriferous.

Packed 2 boxes with specimens. Delivered them to Mr. Hennis warehouse for spedition .Likewise left yesterday 2 boxes at the Calumet depot for spedition (shipment ?) Laundry 3 white shirts, 1 wool shirt, 3 kragen

Saturday Aug. 2. Concluded to see the Vermillion lake iron mines. In company with Mr. Breitung leave Houghton tomorrow with boat Peerless. Paid hotel bill and washing after my return $5.50

Sunday 7 o'clock morning left Hancock. Arrived at Agate Harbor Monday morning at 4 o'clock. Went from here to Duluth. Came there about 8.

Monday Aug. 4. Duluth is situated on the slope of a row of rocky hills about 400 feet high facing the lake. We find first a massive coarsely crystalline diabase intersected by dykes of red feldspathis rock. This diabase is quarried for a building stone and dressed into square blocks. Ascending the hill this belt a few hundred feet in thickness shows numerous variations in coarseness of grain and relative proportions of components. Next underlying it is a flesh red feldspathic crystalline rock belt of considerable width. It corresponds with the dykes intersecting the diabase above it. Lower and forming the summits of the range are again diabasic rocks similar to those at the foot of hill.

Diagram

3 pages of German

At 3 o'clock in the aftern oon with tug to Agate Harbor. Arrived at 7. Stayed in the hotel.

Wednesday Aug. 6. 7 o'clock with railroad to Vermillion lake mine. Arrived at one. Stopped on the road in several places to examine the rock. 2 miles from the harbor is the first cut through a dark rock belonging to the copper bearing series. Then for a long way no rock exposures. At the Masaba Range about 42 miles from the harbor the granite comes to the surface forming prominent hills and then for several miles also forming the surface rock on the low lands north. Subsequently stratified quartzose rocks of bluish color dipping under high angle north come to the surface. This rock resembles some the blue rock beds on the slope from the Summit station on Houghton and Ontonagon R R. to LeAnse. They form a very wide belt.

At the mining location on a range of hills 800 feet above Lake Superior a succession of hydromicaceous quartzites , hydromicaceous schists of grey or reddish color either mingled with banded jasper beds. At least 3 large belts of pure compact specular ore are interstratified some of which locally are over 60 feet wide with the ore and seemingly overlying it is also a belt of red jasper banded mixed ore. The strata are all nearly vertical. Dip north.

Diagram

The ore is remarkably free of rock and the surrounding rock remarkably free of iron. Some of the strata locally have a brecciated character, the red jasper banded strata perfectly identical with those of the Jackson mine are similarly contorted.

Diagram of above.

On the south side of this range of iron rocks the village Breitung and on the northern side the village Tower has been established. From Tower to Vermillion Lake the distance is only half a mile. The river entering Vermillion Lake passes through the village.

Thursday Aug. 7. With Mr. Mallman, an employe of the mining company, examined the structure of the iron range north of the mines toward Vermillion lake. On the hill on which the so-called Lee mine is, I see on the south slope of the hill the hydromicaceous schistose quartzites of more or less slaty cleavage, white or weathered surfaces greenish in the interior. Then follows a belt of pure ore 8 or 10 feet wide then schists and banded jasper rocks and with the banded jasper a large belt of solid ore. The ore and the jasper are on the line of junction often intermingled in a coiled manner. On the other side of the ore belt again banded jasper, hydromicaceous quartz schists follow. The Lee mine hill is the southern counterpart of the hill on which the Breitung and Tower mines are located.

Going over to that we transgress a large series of hydromicaceo schists, some slaty and more or less silky shining, others harder, more quartzose and not so fissile. This belt is not less than 4 to 500 feet wide. Then comes a belt of ore, then hydromicaceo schists, then a large ore belt, the principal one of the mine. Then banded jasper, a large belt. Then hydromica schists, a wide belt more or less quartzose and locally brecciated. Then a very large belt of banded jasper again much corrugated and contorted. The banded jaspery layers and the hydromicaceous are often intermingled in labyrinthically pervading one another.

Diagram

North of all these again hydromicaceous brecciated schistose quartzites or greenish hydromica schists follow. Then a very large belt of magnetic banded jasper beds of darker more blackish color than the former. They contain narrow belts of ore often large enough to induce the explorer for sinking testpits in it.

North of this magnetic belt hydromicaceous schistose quartzites follow forming a wide belt touching the shore of Vermillion Lake. Further north a ridge of magnetic quartz schist projects. And in the lake north of this a large number of the islands are composed of the quartz schists and brecciated harder ouartzrocks as far as the eye can reach.

One mile south of mines on railroad cut through hydromicaceous quartz schists. Dip north, high angle. Farther a mile another cut, blue slate compact. Dip north to near to Engineers camp, lower end of 64 mile. 5 miles from mine calcareous schist. In N.½ of T.60, R. 15 another cut through blue quartz schist 9 miles from mine. Red granite in S.½ of T. 60, R. 15. 48 miles from shore on south side of Mesaba hematite, then blue slate, on 46 mile . Diabase cut is further on the miles 40.

Friday Aug. 8. Went to bluffs at Agate Harbor. Dip under low angle toward lake. Top layers a fine grained massive trap of black color containing nodules of agate and druses of quartz. Below it a large belt of brown amygdaloid full of laumonite amygdules, some tinging of malachite. Left at 10 o'clock for Duluth with tug. Mr. Brown keeps a good hotel at Agate Harbor.

As Mr. Malmann informs me, there is a belt of magnetic schists also found on the south side of Mesaba hights north of the outcrops of hematitic schists on the road.

2 diagrams.

Aug. 9. Saturday. Near Thompson. Slates and sandrock ledges, dip S.S E. under high angle. A basaltic dyke 2 feet wide intersecting them on the road. The strata further on all corresponding in general character with the Huron Bay slates, show distinct lamination of sedimentary origin which as before said has a dip S.S.E. under an angle of about 45 degrees. The cleavage of the slates is vertical in its position.

Diagram

These slates are near the saw mill at the junction intersected transversally by a branching augitic dyke of which the larger branch is 20 feet wide coarsely crystalline.

Going down the river at the second bridge above Fond du Lac in the bed of the river a light colored quartz conglomerate alternating with white sandstone in nearly horizontal position dipping slightly to the S E. is seen in immediate contact with Huronian slates of bluish grey color, lighter than those at the Dallas . They strike east and west and dip south.

Diagram

The entire series of slaterocks exposed from the junction down to the just mentioned point of inconformable contact with the lower conglomeratic beds of the Silurian formation is amounting to an immense thickness. Arenaceous belts alternate with purely argillitic slates. The lower beds near the junction station and lower down the river are much more compact than those last exposed in the upper horizon which are lighter colored, softer and readily cleaving into small angular fragments.

These rocks are indubitably an analogon of the Huron Bay roofing slates. They are succeeding below the diabase series of Duluth and are above the iron bearing group of Vermillion lake. I collected several drift boulders which I did not label when packing the box. Two of them are boulders of diabase from the Duluth series. One is a very coarsely crystalline porphyritic diabase. Returned to Duluth at 5 in the evening. Expense for me and Mr. Mallmann $5.00. Packed a box of specimens.

Some of the layers of the roofing slate exhibit a plainly corrugated structure of their substance and most of them a distinct sedimentary lamination which intersects the slaty cleavage under a more or less obtuse angle.

Diagram.

There is also by this lamination the plication of the slates perceptible as in some places it dips in opposite directions.

Diagram

Specimens of silver bearing copper ore from Suci Island at Pigeon Bay on north shore of Lake Superior 40 miles south of Port Arthur.

2 pages German.

8 o'clock in the evening with steamer Fremont to Houghton . Fare $9.00

Monday Aug. 11. 6 o'clock in morning in Ashland.

Tuesday Morning in Houghton. Delivered a box of rocks to Hennis warehouse. Then took train to Marquette. Hotel bill $1.00 Received letter from home dated Aug.5. Roofing slate from also on the slope of Huron Mountain towards Michigan. Champion Station 31 miles to Marquette, 64 miles to Houghton.

Wednesday Aug. 13. With 2:30 train to St. Ignace and home. Said to arrive at 9 in the morning at South Lyons. Delay to 3 o'clock.

Notes from front fly leaves. Magnetic S.E.¼ of N.W.¼, Sec.20,T.47,R.30 Mineral of Adventure and other mines a quite sharp angled 4 sided prism with oblique truncation on the obtuse side of the prism apparently evenly intersecting both sides under very oblique angle. The oblique terminal plain more or less rounded, convex. Compare axinite ? Diagram of figure

Diagram of magnetic mine

9th level, north of shaft No. 4 about 100 feet. 93 from each level or 60 ft, perpendicular. Capt. Th. Hodson, Hecla.

2 diagrams from back fly leaves.

Prof. Weissbach, Freiberg. St.Paul & Duluth R R. & A.M. North. Pacific Junction Report Winchell 1881 and 82.

C. Roninger Ann Arbor, Mich.

Diaries of Exploring Trips of the Joplin and Northern Arkansas Region

Notes from front of book. Major F. Y Anderson J(I) C.T. G.D Fitzhugh
Herman Schoel, Engineer. Cementville, 7 miles. Seltosberg 10 miles Cement quarries.

Left Ann Arbor July 7, 1896 for Alpena with morning train at 7:45 (or 7:35)
Fare for two 15.50 T.A. road. Arrival at Bay City at noon Arrival at Alpena
7:50. Alpena Hotels Churchill 2.50
Golling 2. for 1 D. per day
Alpena House 1.50 per day

July 8. Morning to Phelps Quarries. (In German)

July 9 Morning with buggy to Pardridge point. Rate 1.50 per diem. Returned from Pardridge Point 5 o'clock. Good driving road to the place. Found the usual fossils, crinoids, corals, ectr. The old farmer McConel(McCaulay) is there yet and kindly received us. Met in the evening Dr. Howell, an Ann Arbor man.

July 10. Looks like rain. Intend to go up Thunderbay river with buggy. On account of rainy outlook we did not go but I went alone to Phelps quarries. Found there a number of good crinoids in the stratum. Next below the surface layers of bluish color and argillaceous shaly structure associated with the crinoids are numerous Favosites, Cyathophyllum Davidsoni, (Strombodes - Ptychophyllum) ponderosum, many Stromatoporas.

Left Ann Arbor Wednesday June 1898 by Mich. Central for Detroit, 2 fares		2.24
	baggage	.35
	street car	.35
2 Wabash tickets for Louisville		20.30
	baggage	.50
	Street car	.15
Louisville (or Ludw(ig) draft for		200.00
	Pier (Beer ?)	1.00

Left cash 85 dollars

June 13 1900.	Left Ann Arbor for LaSalle, R.R. fare 9.75 plus .25	
15	Left LaSalle for Louisville by way of Chicago and Big Four line, ticket	10.75
16	Arrived at Louisville 7 :30 in the morning	
	Expenses for ? and omnibus transport up to Sunday June 17	1.50

Took from home 90 dollars besides 50 dollars from my bank deposit in Louisville.
R.R. fare from Louisville to Fulton 7.80 plus carfare .20.
June 19, Left Louisville
2 pages in German

Arrived at 2 at Litchfield, a village of about 1500 inhabitants.
Hotel Heyser. Was informed that a Mr. Stone was well versed in the geology of the environs. Will be introduced to him as beforesaid. The country here is rolling land all over covered with a reddish yellow sandy soil.
First tunnel in the top part of St. Louis group. Second tunnel in the Clifty sandstone.

(St. Louis base no outcrops). Above Clifty sandstone 40 ft Above 40 feet of limestone fossiliferous casyrkia. Above 40 feet of land again Litchfield sandstone on which stands the courthouse and the hotels. Above 3 feet shale. Above 17 feet limestone, second lime(stone), above 12 feet shale again, above 5 feet lime. Above a green sandstone 13 feet, above 10 feet shale and limestone mixed. Above 20 feet of shale. Above 15 feet mixed yellowy ochery rock. Above 10 feet shale. Above 5 ft. lime, highest stratum of lime. Above 50 feet mingled masses(?) of limestone, sandstone and shale, one layer of deep red color near top of the series. Above 25 to 30 massive sandstone Sand. No. 4. and above about 8 feet of fireclay. On that a coal ned, coal No. 1, about 1 foot. Abovecoalabout 30 feet of sandstone. 30 inches coal No.4 feet. Second coal from stone in the strata above the second coal.

In the big clifty they find asphalt in cavities. Litchfield sand(stone) contains likewise asphalt. Coal No. 1 on it the richest asphalt deposit. The 17 feet limestone fossiliferous, archimed.

Record of my own observation made in Co. with Mr. Stoen starting from courthouse of Litchfield which is situated on a fine grained flaggy sandstone with many ripple marks and amounting in toto to about fifty feet. We find in descending to a creek that the strata dip S W. in the creek northeast of the courthouse. Under this sandstone a massive limestone about 40 feet thick crops out. It contains Archimedes crinoids stems ect. but nothing can be got out of them. Under this limestone in the bed of the creek is another coarser grained more or less ferruginous sandrock of considerable thickness. It is called by Mr. Stone the Clifty sandstone and is said to rest immediately on the St. Louis sandstone which is not uncovered here.

Going south from courthouse the road descends at the same rate as the Litchfield sandstone dips. We find it in the creek where it is quarried. Beyond the creek in ascending the road we come unto an alternating series of limestone beds, shales with calcareous seams full of bryazoa which represent the fossiliferous strata of the Chester group but crinoids are very rare in them. The intermediate soft shales contain no fossils.

Diagram

June 20. Second excursion with Mr. Stone. On the property of Rob. H. Brown, 4 miles from Litchfield S.W. near Morgantown road 2 miles from Black Rock Station on the railroad the coal mine. 1.50 On this excursion to R.H Browns coal mine we were constantly traveling over the previously described series of strata above the Litchfield sandstone. Later on however we came into higher strata which we had not seen before but of which Mr. Stone had given me a description. These upper members are prevalently shales of various colors, bluish yellow and on the upper limits a deep red colored shale belt above which a bench of massive limestone with productus marks the top of the Casvekia group Sent specimen of the fireclay to LaSalle had to pay in advance 71 cents.

June 21. Arrived at Central City at noon. Went to the Sandusky house. The general manager of the mines is Mr. Findlay. The hotel keeper will introduce me to him. As far as I learned from some laborers there are 3 beds of coal worked in the mines. Coal No. 12, 11 and 9. The 3 beds are different in character. Some of the fireclay beneath one of the coal seams is said to be about 2 feet thick. A sample of it was some time ago sent to Louisville to be tested but no answer was received therefrom. I suppose that it had no satisfactory qualification for a fireclay.

The depth of some of the mines here is 200 feet but other shafts are below one hundred feet deep only.

Mr. Duncan, the president of the Co. whose acquaintance I made is a very friendly man, tells me that the only coal bed actually mined in 7 mines around this place is coal No. 9. Under it is a fireclay of variable thickness, generally hard stone but occasionally also plastic but he is under the impression that this clay is not of very good quality. There is a coal seam seen along the road in cuts through massive sandrock close beneath them which he supposes to be the equivalent of coal No. 11. The average thickness of Coal No. 9 is4 feet unto 5 feet.

Mr. Findlay, the superintendent of the mine is only short time in this position and therefore not so well acquainted with the geological details of the mine but he introduced me to the mining boss who will show us through the mine tomorrow at 9 o'clock.

Friday June 22. Rainy day. Wrote a card to Ludwig. Left Central City at 1 P.M. for Princeton. Level country. Several coal mines on the road 1 or 2 miles from Central City. Pad non, Palmer house In the city by omnibus. Ticket to Marion .75 Hotel 1.50

June 26. To laundry 2 collars, 1, wollen shirt, 1 handkerchief.

Tuesday June 26. Went to see Mr. F.A. Bauer at his factory of all kinds of pottery and observed that his furnaces were all built of firebrick from LaClede which causes me to suggest that no high grade refractory clay is to be found near Paducah or there would certainly be a factory of such brick which are largely used also in other potteries and furnaces of Paducah.

Mr. Bauer pointed out to me the following localities where clay pits are worked along the line from Paducah to Fulton.
Boaz. 14 miles from Paducah where Bauer owns and works clay pits.
Hickory. 18 miles . clay pits.
Pryorsburg about 30 miles. Important clay pits.
Water valley 39 miles. Clay pits.
Further I am informed that a captain of a steamboat Jac. Fowler owns some clay pits along the Tennessee river not many miles south of Paducah.
Mr. Bauer directed me also to make the acquaintance of Mr. George H Dains secretary of the Commercial Association who has his office at the Palmer house.

A train leaves Paducah in the direction of Fulton daily at 4:35 P.M.
From Fulton are daily 3 trains towards Paducah
At 10:35 A.M arr. at Paducah 11:40
At 12:25 A.M.(night)
At 6:00 A M. arr. at Paducah at 7:40

Made the personal acquaintance of Mr. Dains and was introduced by him to Capt. Fowler who has lately discovered on his property next the Ohio River a clay deposit supposed to be of superior quality. I made the arrangement with him that I shall first examine the clay deposits along the line from Paducah to Fulton, then come back and be taken by him on a boat to his clay banks So I intend to leave this afternoon in the direction of Fulton at 4:35 stopping off at Boaz first. Hotel bill 2.50 paid.

At Boaz Station. There is no hotel. The clay pits of Mr. Bauer are about 1½ miles back on the hill side and the man working in it had no house to keep anybody. He is a very poor man. He accidentally mentioned to me the name of E B Johnson and said that he saw Mr. Johnson leaving me the cart at the station. As I am told, Johnson is a kind of explorer and has first opened the clay pits at Hickory. Presently is a partner of a Co. which digs gravel for the city in a bank short distance from Boaz Station close to the railroad. In the clay pit of Bauer there is a stratum of red alluvial clay mingled with gravel forming the surface. It is at the pits only a few feet thick. Then follows a belt of white or pale reddish clay, some seams a little sandy by (but) generally of soft impalpably fine grain being on knetting quite plastic. It has in itself numerous imprints of dicotyledonous leaves. Some appear like chestnut leaves. Its visible exposure is about 15 feet thick and all of it about the same nature.

On the railroad a few hundred yards before reaching Boaz station similar clays crop out and above are gravel deposits of great thickness which are mined by the people all over the country along the railroad. To ballast the road bed similar beds are largely used along the road near Princeton.

The clay pits of Hickory are two and ½ miles off from the road. I made the arrangement to be carried in a buggy to the clay pits of Hickory and back to the railroad station in time for the train for 1.50. Paid the man at Bauers pits 50 cts. and for night quarters and meals at Boaz one dollar.

The white clays are all over the country spread out beneath the gravel deposits which are in places so thick that the clay cannot be mined. In other places the clay is very near the surface at up to 30 feet in thickness. Some thin streaks of sand are often seen irregularly interstratified.

Pat Halloicen ? owner of the pits 2½ miles west of Hickory station. The pits are presently filled with water. The clay beds are represented to me to be from 15 to 30 feet thick. The clay is covered by gravel beds and brown loam strata. At the pits which are next the bed of a creek the clay is very close to the surface. Its surface is considerably eroded and the gravel fills out the eroded gaps in it. The gravel is frequently cemented into a conglomerate rock. Proceed with train to Pryorsberg where I stop.

At Clay Switch there is no regular stopping. The pits are visible from train. The clay is under a very thin covering of gravel. It is five miles north of Pryors Station. Sent by express a box of specimens to LaSalle 80 cts paid. In the box is a letter of explanation.

Leaving south from Fulton a level partly over floated country with rich agricultural soil. A deep reddish brown loam underneath of which here and there the white clays are visible without the intervention of gravel deposits up to Station Martin, the next stopping place. The same conditions, fine farmhouses along road, splendid forests.

To Greenfield station 3rd stopping place, the same character of surface continues.

Russel. Same character continues. White clays exposed in cuts.

Milan. Next stopping. All level country. Fine hotel.

Medina. White clay outcrop. White clay stratum prevalently sandy.

Jackson, Tennessee at seven in the morning. Asit appears, a considerable business place. Much overfloated land south of town. No change in the geological features, the red loam on surface very thick, the white clay beneath it a soft argillaceous sand stratum corresponding with the clay beds north.

Towne Station

Bolivar. Hickory valley. Flat level land formation of the surface as before poor agricultural land still.

Lamar Station. Holly springs. Started for Birmingham 9:45. Geological structure of the surface same as before unto Pots' Camp.

New Albany and further on before reaching Tupelo other lower strata of a bluish grey shale are here and there exposed. Low lands near Tupelo all inundated.

Amory. At 12 noon. Level low lands

Eldrich. 66 miles from Birmingham. Large exposures of shales and sandstones alternating. Coal mines at Carbonhill 60 miles from Birmingham. Pocahontas 56 miles from Birmingham. 2 pages in German.

Clay pits at Tuscaloosa, Alab. 50 miles from Birmingham. Stows Furnace. Visited his establishment. Come back here and take another car line. Thomas Furnace, Ensley City . Florence hotel corner a centre point for all car lines.

Published 1900. Extracted from Alab Bulletin of Geology Report , Fireclay of F C Bean of Tuscaloosa Co. " A fine grained clay of very little grit and of homogeneous structure. When immersed in water it slacks with extreme slowness. Mixture with 36 per cent water gives a very plastic mass and bricklets made of it had an air shrinkage of 12 per cent. Burned to 2200 the total shrinkage amounted to 18 per cent, bricklets greyish red in color and very dense, incipient fusion having occurred. When heated to cone 27 in the Devrille furnace it only vitrified. Analysis of it.

Silica	58.13	Clay substance	60.85
Alumina	24.68	Quartz	23.35
Ferric oxyd	3.85	Feldspar	15.80
Lime	.15		
Magnesia	.32		
Alkalies	1.75		
Ignition	11.70		

This clay is said to be from the lower cretaceous beds. From Muhlhaufers letter to Warren written May 24, he said the white clay sent to him he found no good but the dark clay sent to him might probably answer but he had at that time not quite finished his analysis. Dinner 50 cts. Breakfast 25 cts. that day.

Friday afternoon left with Mr. Bean for Tuscaloosa, about 50 miles from Birmingham to see his claypits. To Tuscaloosa 1.65. At Bibville on our way are clay banks denuded which are and for the Bessemer Firebrick in that same neighborhood. Large elevated limestone beds crop out. See Geology Bulletin of Alabama.

Description of a railroad cut of the Mobile & Ohio road which (runs) diagonally across Mr. Beans land.

The top part of the hill is formed by soft brownish or light colored sandrock deposits without much visible lines of stratification which in the centre of the cut amount to about 25 feet in thickness. The base of this is formed by a consolidated hard bench rich in iron and only about 4 inches thick. Next under it is a darker more fine grained seam likewise very rich in iron oxid constituents. Below it are thick grey and purple variegated fine grained plastic clay strata visible to the extent from 6 to 8 feet thickness.

The men tell me the thickness of clays of the same nature continues deeper down but the material of sand fallen from above hides all the lower strata from view. This cut is near the ten mile post of the railway counting the distance from Tuscaloosa. Returning to the spot where we left the buggy there are higher beds above, the 25 feet sandrock exposed. Crowning these are other highly ferruginous concretionary layers followed by variegated clay seams very similar to the lower large clay bank and above more sandy variegated clay deposits follow which we have before often seen exposed and of which I thought they were guatemari. The surface then is formed by loose fine grained gravel.

On the return trip I noticed that the character of all the exposed surface strata was fully corresponding with that I had seen in the railroad cut on Mr. Beans land which strata are in the report mentioned as of lower cretaceous age while the entirely similar strata exposed at Tuscaloosa are by Prof. Little claimed as quaternary with which opinion I am inclined to agree. Will hear Prof. Smiths opinion when I meet him. Conveyance to the clay pit 10 miles distance. paid 3 dollars. The gravel is largely mingled with red loam of little signs of stratification. It is an irregularly twisted mass. Mr. Beans land is on Sec. 31, T. 20, R. 11 in Tuscaloosa Co.

Sunday July 1. Visited Prof. E. Smith with Prof. Little. Met also the president of the University and several other members of the institution. The museum contains a good representation of the formations and fossils of Alabama as far as cretacious and Tertiary formations are concerned, also neighboring states are represented. Of Silurian and Devonian fossils there is nothing more than the characteristic leading representatives of each formation for demonstration purposes in the lecturing room. Saw more white porcelain clayf from Alabama mines. The university grounds are splendidly restored after the war during which all the buildings were destroyed and burnt up with their contents from the northern soldiers.

Mr. Eugene Smith introduced me into his family, all of which were extremely kind toward me. I at dinner with them. Afternoon returned to hotel. Wrote my notes and labelled and packed the specimens. I promised to send Prof. Smith one of the psarosious trunks from Athens. He gave me a few copies of Bulletin 6, one of which I sent to LaSalle with the specimens.

Monday July 2. Monday returned to Birmingham with Mr. Bean. He promised me to show me the mines near Birmingham. On the way collect the clays of the Bessemer fire clay Co. which are representing the same or a similar geological horizon as Beans Clay pits.

Near Cottondale Station cuts on railroad exhibit the upper clay belt next under the conglomerates of quaternary age. Analysis of those clays page 92 and 93. Very few feet lower the coal measure sandrocks are exposed.

Coeling Station coal mines near by. The surface deposits here as before but the clay seam exposed is here more of sandy nature.

Clements Station. Coal mines near. From here to Bibville the Silurian limerock begins to show itself, distinct line of the adjoining strata

Near Wanoys Station the limerock is first noticeable. Beds tilted under steep angle. Before reaching Bibville large clay pits seen near the road. ? of Bibville clays. This clay is used in the fireclay work of potteries(or Bessemer) Arrived at Bessemer half past eleven. I took from this clay samples at the works of the Bessemer Fireclay Co. Sent them with the other samples to LaSalle. Paid hotel bill 5.00, Fare to Bessemer 1.50, dinner at Bessemer .50, Bessemer to Birmingham .25, Supper .35, Express charges 1.50.

July 3. Arrives after 5 P.M. at Florence. Ticket 4.00. Train to Sheffield by way of Jasper leaves 12:10 P.M. Examined Rand & McNally's map and found that Ashland is in Boyd Co. Eastern Ky. Hotel .75 .

At Palos Station an outcrop of a coal bed covered by sandstone. Coal mines at Horse Creek Station. Coal formation continues many mile further on,coal beds visible in the cuts to Cordova, 33 miles from Birmingham. Jasper 41 miles. Coal form(ation). Depot ½ mile distant from the Sheffield depot. Train due 2:45. Had to wait an hour.

At Darlington 25 miles from Sheffield large exposures of massive limestone. 14 miles ere we reached Sheffield we were detained for several hours because ahead of us an engine run from the track. Hotel bill at Alabama Hotel, Florence 1.50 paid.

At Florence depot are large outcrops of Silurian limestone subcarboniferous ? and above the hill top is composed of crushed small limestone fragments mingled with dark red clay. A stratum not less than 50 feet in thickness, layers of limestone horizontal massive. Thes same flinty and crinoidal limestone strata are forming large bluffs 50 feet high along the opposite bed of Tennessee river. Surface layers red clay and flint fragments in large accumulation. Fare to Riverton Junction .85 Omnibus .25. The hotel is half a mile off from the river along the road from the Junction to Riverton. From that place are also the limestones used in construction of the docks.

At Cherokee Station sand and shales of the coal mines. Later one large sandstone outcrop. From Junction ro Riverton .35 . Further on the road makes many deep cuts into the hillsides in which large masses of flint debris, part of which is decomposed into a soft mealy powder seem to form the entire top part of the hills. At the foot, here and there regular flint strata in horizontal position become denuded. From Riverton to Clifton the distance is said to be 90 miles.

July 5 At Riverton. Met at Riverton a man professing to own a clay bed of superior quality in Alabama, at Athens about 20 miles north of Decatur. His name is T.A.Fogg Pulaski, Tenn. He promised as soon as he comes home to send a cigar box full of his clay to your place.

In the afternoon went with train, 20 cents going and return, two miles backward to Dr. McWhorters house where a company mined for silex, a decomposed powder-like snowwhite mass of flint used in porcelain manufacture.

This decomposed mass is an integrant part of a series of regularly stratified flint beds underlying the debris mass of flint fragments and waterworn pebbles of the same, and as far as I could ascertain resting on flint bearing limestone strata which are quarried at Cherokee Station and used as building material of the Locks. Hotel bill at Riverton 3.00, room No. 3. Boat to Clifton 2:15. Left Riverton about 11 A.M.

Captain of the Paducah told me a fine fireclay is near Clifton but he confused fireclay with phosphate rock.

2 paragraphs in German

On the whole distance to Lexington only Flint debris partly decayed into white silicious clay and afterwards ferrugineo arenaceous well stratified shales or on them alluvial deposits are to be s en. The country does not appear to be very fertile. Near Paris large exposures above of red loam, below of a white clay with much sand, too much of it to be useful. ½ past 8 P.M. Paducah .25 transfer. Hotel bill 1.50 , transfer .25, other expenses .50 . Left.11:45 for Louisville July 11.$6.70.

Notes from back of book.

See Sibley Brick Co. at Marion Station on L. & N R.R. 24 miles north of Birmingham See Moss Brick Co. 2 miles south of Morris Station on L.& N.R.R. 16 miles north of Birmingham. Go to Prattville Junction on L & N.R.R. about 8 miles north of Montgomery and go out on Prattville Branch R.R. about 5 miles or more and near mill (?) See large deposits of good clays.

Paragraph in German

Chs. Golling 3rd Str. 627
Alexander McAuley, Pardridge Point
McDonald 3rd St. Boarding house.
6th St. Chestnut and Barret Av. Street car for Highland Ave.

Register of Fossils found in Certain Localities.

Register of Corals in my Collection on Jan.first, 1906.

Register of Pamphlets and other Publications of the General U S. Government.

Hamilton Group Widder C.W. and Arkona

Diagram

Spirifer mucronatus Conr.
" fimbriatus Conr.
" asper Hall
" zigzag
Spirigera concentrica
Nucleospira concina
Atrypa reticularis
Meristella scitula
Cyrtina Hamiltonensis
Tropidoleptus carinatus
Terebratula Romingeri
Rhyochonella Laura
" Thalia Billings
" Sp. ind. compare Trematospora nobilis Hall.
Pentamerella papilionensis Hall
Strophodonta demissa
" concava
" perplana
" nacrea
Streptorhynchus crenistria
Orthis Vanuxemi
Crania crenistria
Chonetes scitula
Platystoma lineatum
Platyceras sp.
" sp.
Pleurotomaria sp.
" sp.
Enomphalus ?
Tentaculites
Goniatites uniangularis
Nautilus
Gomphoceras
Orthoceras sp
" sp.
Phacops bufo
Dalmannia calliteles
Crinoid stems and plates
Cacabocrinus
Cyathophyllum sp.
" sp.
" sp.
Cystiphyllum americanum
Heliophyllum Hallii
" sp.ind
Diphyphyllum Archiaci
Zaphrentis
Syringopora
Aulopora alternata Hall
" serpens ? Goldf.
" ?

Favosites Billingsii
" placenta
" turbinatus
" Huronicus
" sp. not determined perhaps a juvenila variety of Billingsii. Billings determined it as Fav. cervicorni
Alveolites Goldfussii
Cladopora Fisheri
" Roemeri
Striatopora Linnaeana
Trachypora elegantula
" ornata
Chaetetes hirsutus
Fistulipora crassia
" utriculus
" elegans
Trematopora
Coscinium lineaolatum
Phaenopora intercellulosa
" asperula
Fenestella
Polypora
Retepora
Asterapora
Stromatopora canadensis

Fossils from Long Lake - Lower Beds of Hamilton Group

Stromatopora Wortheni and also
" monticulifera in loose specimens.
Cyathophyllum
Cystiphyllum (Acervularia Davidsoni ?)
Cyathophyllum Compound. Star cells large structure of Heliophyllum.
Favosites Hamiltonensis.
" ramose forms
Syringopora
Cladopora
Asteropora
Fistulipora
Chaetetes
Atrypa reticularis. large siliciferous.
Spirifer granuliferus
" mucronatus
Cyrtina Hamiltonenses
" umbonata
Orthis Tulliensis
Pentamerus costatus
Spirigera concentrica small form
Strophodonta,variety of demissa ? erratica Winch.
Productella dumosa
Terebratula
Myalina large
Some large Enomphaloid casts
Crinoid stems

In the carbonaceous limestone strata occupying a higher stratigraphical position and forming the top of the hills joining the lake I collected

Favosites Hamiltonensis
" ramose forms
Atrypa reticularis
Spirigera concentrica
Productus dumoas
Pentamerus occidentalis ?
Strophodonta erratica
Terebratula
Spirifer granuliferus
Cyrtina umbonata and Hamiltonensis.

Fossils in Shaly Limestone at Carters Quarry and Environs T.31,R.8 E.Sec.20 Strata occupying a position next below the Stromatopora beds of Stony Point.

Cyathophyllum simplexi ? Hall
Cystiphyllum aggregatum Billings
Diphyphyllum archiaci Billings
Acervularia Davidsoni
Favosites Hamiltonensis
" mamillatus and some ramose forms
Chaetetes ponderosus
Phaenopora
Fenestella
Fistulipora acervulosa
Stromatopora Wortheni
" sp. ind.
Atrypa reticularis
Cyrtina umbonata Hall
Pentamerus aratus
Spirifer fimbriatus
Terebratula (large)
Strophodonta demissa ? variety
Lucina (proavia ?)

Fossils Trowbridges mill.

Favosites Huronicus

The following from upper beds on top of hill and under Broadwells mill race

" mamillatus
Strombodes Johanni (Smithia Hall)
Diphyphyllum latiseptatum
" archaici
Acervularia Davidsoni ?
Cyathophyllum simplex ?
Cystiphyllum americanum
Aulopora Serpens
Trachypora
Striatopora Linnaeana
" rugosa
Bryazoa, numerous forms of
Ancyrocrinus
Cacabocrinus
Tentaculites
Stromatopora wortheni
Orthoceras
Several gasteropodes

Trowbridge Mill fossils continued. Forms in the lower beds, but also found above.

Fistulipora spinulosa
" crassa
Chaetetes
Atrypa reticularis
Spirigera concentrica small form
Cyrtina Hamiltonensis
" umbonata
Spirifer mucronatus
Pentamerus papilionensis
Spirifer divaricatus
" granuliferous
" fimbriatus
Phacops bufo
Terebratula
Strophodonta demissa
Crania Hamiltonensis
" crenistriata

Fossils from Middle Island Lake Huron - strata supposed to represent the lowest beds of the Hamilton group.

Stromatopora textilis
" Wortheni
" Sanduskyensis ?
Cystiphyllum
Remarkable is the absence of other Cyathphyllum and of Favosites
Most common is
Enomphalus Deckeyi
Lucina proavia ?
Atrypa reticularis with very delicate fine ribs.
Pentamerus, small globose form. nucleolus
Bellerophon 2 species
Pleurotomaria
Strophodonta nacrea
" not accurately determinable
A Myalina - carinata Rgr. and a few other bivalves
Avicula flabella ? N Y Rep.
A Fistulipora covering the former shell (avicula).
A large Nautilus sub-quadratic depressed volutions
Fragments of orthoceras - diagram
Gasteropode, entirely closed umbilic. spira scarcely projecting volutions triangular.

Diagram

Same strata on Presque Isle.
Eridophyllum rectiseptatum
Spirifer gregarius
Spirigera concentrica glabosa

Fossils on McArthurs farm 7 or 8 miles southwest of C rawfords Quarry. Shaly limestones opened by digging a well. The same shaly limestones are also exposed in several other places in the neighborhood.

Favosites Hamiltonensis and several other forms.
Acervularia Davidsoni
Cyathophyllum
Stromatopora Wortheni
Aulopora
Fistulipora
Atrypa reticularis
Pentamerus aratus
Streptorhynchus
Spirifer granuliferus
" mucronatus
Cyrtina Hamiltonensis
Strophodonta concava
Productus navicella
Strophodonta nacrea
Lucina proavia
Some gasteropodes shells, casts.
Large plates of fish panzers.

At Crawfords Quarry representing the strata just below

Diphyphyllum latiseptatum
Cyathophyllum
Acervularia
Favosites, several
Stromatopora monticulifera and Wortheni
Lucina proavia
Orthoceras
Atrypa reticularis

Fossils Stony Point, Alpena

Stromatopora monticulifera
" Wortheni
"
"
Cyathophyllum rectum ? Hall
"
Heliophyllum Hallii
Diphyphyllum Archiaci
Acervularia Davidsoni rare
Favosites Hamiltonensis
" mamillatus
Alveolites Fenestella
Polypora
Aulopora localipora
"
Fistulipora
" serpens ?
"
Chaetetes
Atrypa reticularis
Spirigera concentrica
Pentamerus aratus

Strophodonta demissa
Crania Hamiltonia
" crenistria
Conocardium small
Phacops bufo

Fossils upper strata of Hamilton group near Phelps Limekilns north of Alpena including the limestones at the limekiln supposed to be identical with the strata under Broadwells mill and those on top of hill near Trowbridges.

Stromatopora Wortheni
" similar to Wortheni but with larger monticules or without any.
" plana
" monticulifera
Heliophyllum Hallii
Cystiphyllum americanum
Cyathophyllum compactum
Acervularia Davidsoni ?
Strombodes Johanni
Favosites Hamiltonensis
" radiciformis
" turbinatus
" several not yet determined.
" in suctus forms
Cladopora Alpenensis
Striatopora Linnaeana
" rugosa
Syringopora nobilis Billings ?
Fragments of Orthoceras
Casts of gasteropods
Chaetetes
Fenestella
Polypora and other
Bryazoa
Cacabocrinus
Spirigera concentrica
Strophodonta demissa
Pentamerus aratus
Rhynchonella
Terebratula
Strophodonta nacrea
Cyrtina Hamiltonensis
Atrypa reticularis

Thunder bay Island Strata

Stromatopora monticulifera
" Wortheni
" flat expansions of, structure like dextilis
Acervularia Davidsoni
Cyathophyllum rectum ?
Favosites Hamiltonensis
" mamillatus
" ramose form
Cyathophyllum compactum

Syringopora
Fistulipora
Terebratula
Pentamerus aratus
Strophodonta erratica
Spirigera concentrica
Atrypa reticularis
Spirifer ziczac
Productella Hall
Gomphoceras fragmentary
Orthoceras "
Proetus "
Phacops "
Bryazoa
Fossils generally in quite imperfect preservation.

Huron Lake Shore T. 32, R. 9 E. Sec. 27 and 21.

Stromatopora monticulifera, only few
" Wortheni , also a ramose form of stromatopora majoril
" " variety monticulifera explanat growth
Favosites, ramose specimens. cespitose matter
" Hamiltonensis
Acervularia Davidsoni
Zaphrentis
And in some beds Cystiphyllum

In the lake pebbles also strata represented with numerous Bryazoa and several brachiopods shells not identifiable Orthis, Strophodonta ectr.

Exploration for a marble quarry by a Detroit Co. in T.32,R. 9 E. Sec. 6. Above about 20 feet of shattered nodular limestone with ana abundance of Str.Wortheni ,Str. Monticulifera, acervularia Davidsoni, Diphyphyllum Archiaci all in obsolete structural preservation. Below blue clay 50 feet penetrated containing

Atrypa reticularis
Strophodonta demissa
" concava
Spirigera concentrica
Spirifer mucronatus
" ZigZag
" granuliferus ?
Chonetes coronata
Rhynchonella
Cyathophyllum simplex
Stromatopora monticulifera
Cystiphyllum americanum
Str. Wortheni
Crinoid stems
Fistulipora
Chaetetes and other
Bryazoa

Fossils Hamilton Strata of Rainy River Entering Black Lake near Cheboygan.

Highest about 20 feet of limestone with Stromatopora and Acervularia

Below a few feet of shaly limestones. Under them again limestones with few fossils.
Shaly limestones contain Acervularia Davidsoni
Zaphrentis
Cyathophyllum
Heliophyllum Hallii
Cystiphyllum
Favosites Hamiltonensis and ramose forms
Fistulipora spinulosa
Syringopora nobilis
Atrypa reticularis
Spirigera concentrica
Strophodonta demissa vareity
" concava
Spirifer zigzag
" medialis ? or granuliferus
Proetus, a head

Strata of Black Lake forming a bold rocky hill with vertical exposures in T. 35, R. 2 E. Sec. 7.
Above hard limestones with
Stromatopora monticulifera and
" Wortheni besides
Acervularia
Favosites Hamiltonensis and
reticulatus

Below shaly limestones with
Acervularia, great profusion
Cystiphyllum
Cyathophyllum
Atrypa reticularis
Strophodonta demissa and
" concava
Spirifer granuliferus.

Fossils of Hamilton Strata at Little Traverse Bay- Petoskey.
Upper Stromatopora beds forming a large escarpment at the mouth of Bear River immediately below the railroad station. Thickness of this series 45 feet.

Stromatopora pustulifera
" monticulifera
" cespitosa
Favosites Hamiltonensis
" dumosa, Winchell
Heliophyllum Hallii, rare and small.
Cystiphyllum Americanum
Diphyphyllum ratiseptatum (Cyath. panicum, Winchell)

Atrypa reticularis
Spirigera concentrica
Pentamerus
Strophodonta erratica
Terebratula
Spirifer fimbriatus

Conocardium (small) and several undetermined bivalves
Pleurotomaria cavumbilicata Winchell
Phacops(pygidium)
Gomphoceras
Orthoceras

Verta (see) limestones. Beds lower than the former with an abundance of Stromatopora of different form and with Cyathophyllum Davidsoni which are interstratified with black carbonaceous seams abounding in Strophodonta erratica and other fossils and with soft blue shales likewise rich in fossils enumerated below.
Acervularia(Cyathophyllum) Davidsoni
Favosites Hamiltonensis
" nitella and other species
Cyathophyllum Houghtoni
Cystiphyllum Americanum
Heliophyllum sp. ind.
Ptychophyllum ponderosum
Cladopora, Sp.ind.
Aulopora serpens
" conferta Winchell
Fistulipora Saffordi, Winchell
" micropora Hall
Dendropora proboscidalis
Monticulipora sp. ind.
Hederalla filiformis Billings
Various forms of Fenestellides
Spirorbis ammon, Winchell and several other not determined gastropods.
Megistocrinus, not determined
Fragmental specimens of Phacops.
Stropholosia radicans Winchell
Strophodonta nacrea
" erratica Winchell
" concava Hall
Productella truncata
Atrypa reticularis
Gypidula occidentalis Hall
" intralineata Winchell
Terebratula Traversensis Winchell
" Romingeri
Cyrtina Hamiltonensis
Spirifer mucronatus
" medialis
Athyris polite Hall

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Survey of the Territories.
Vol.II, 1, 2, 4. No. 3 missing

Vol.3. 2, 3, 4. No. 1 missing

Vol.4, 1, 2. 3 and 4 missing

Vol.5. 1, 2, 3, 4.

Vol. 6. 1, 2, 3,.

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1876 Natural Resources of the Black Hills of Dakota by Walter Jenney

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On Ne(w) Sp/ of fossil plants, LesQuereaux and on Lignite formation of Colorado and Wyoming, preliminary report of.

1877 Palaeontology of the Black Hills by R P. Whitefield

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Photographs, Descriptive Catalogue of North American Indians by W.H.Jackson Duplicate

1878 Bibliography of North American Invertebrate Paleontology by C.A.White and Alleyne Nicholson

1879 Carboniferous Fossils from Colorado, Arizona Idaho, Utah & Wyoming and Cretac. corals from Colorado, by C. A. White.

Supplement to Bibliography of North American Invertebrate Paleontology

Report on the Paleontological Fieldwork for the season of 1877 by C. A. White.

Contribution to Paleontology, Cretac. Fossils of the Western Territories by C. A White

1880 Annual report of the Geography & Topography Surveys of the Territories of U.S. west of the 100th Meridian, by G. M Wheeler

First Annual Report of U.S. Geological Survey by Clarence King.

Contributions to Paleontology No. 2 - 8. C. A White

1881 Catalogue of Specimens added to the Cabinet of the Naval Academy of U.S.

1871 U.S Geol. Survey of Montana and Adjacent Territory by Hayden

1872 U.S. Geol. Survey of Montana Idaho,Wyoming & Utah by Hayden

1873 First & Second Annual Report of the U.S. Geol. & Geog. Survey for the years 1867 to 69.

1874 U S. Geol. & Geog. Survey of Colorado and adjacent territory.

U S. Geol. & Geog. Survey Birds of the Northwest by Coues.

1875 U.S. Geol. & Geog. Survey of Colorado and adjacent Territories Hayden

1876 Same title by Hayden

1877 U.S. Geol. & Geog. Survey of Idaho and Wyoming, Hayden

1878 Proceedings of the U S. National Museum, vol.1 & 2,1879, vol.3, 1880

U.S. Geol. & Geog. Survey of the Territories of Idaho & Wyoming part 1 & 2.

Maps and Panoramas to the 12th Annual Report of the U.S Geol.& Geog.Survey of the Territories.

1878 and 79 Rocky Mountains Locust by Riley, U.S Entomological Commission

1880 Monograph on American Pinnipeds by Allen.

1883 Mineral Resources of the United States by Williams. W. Powell, Director

Quarto volumes of U S. Publications

Rhizopods Leydy. Hayden Vol. XII

Exploration of Colorado River of the West, Powell 1869 to 72

Exploration of the 40th Parallel , Clarence King

Odontornithes, Marsh

Tert. Flora , LesQuereaux Vol.7

Cretac. Flora LesQuereaux Vol. 6.

U S. Geog. Survey west of 100th Meridian, Archeology, Wheeler

U.S. Geol. Survey Hayden, Vol.9.

Invertebrate Paleontology, Meek.

Geol. Survey of the Territories Vol.I, Invertebrates

Ditto Vol.4, 2 parts, Paleontology 1877

Ditto Vol.5, Zoology

Geology of the High Plateaus of Utah

Lands of the Arid Regions

Geology of the Henry Mountains

Geology of the Uinta Mountains

Tert. History of the Grand Canyon District, Dutton

Second Annual Report , Powell, 1880 to 81

Report of the Secret of the Interior, Vol.3, 1881

Carboniferous and Sub-carboniferous Corals

Registered Jan.1, 1900.

1. Campophyllum torquicum, St. Louis group, Kentucky
2. Amplexus zaphrentiformis, White, Chester group, Chester from Dr. Hambach
3. Zaphrentis Varsoviensis Worthen - Warsaw limestone, Warsaw, Ill.
4. Zaphrentis spinulosa, Milne Edw. Huntsville, Alab.
5. " " St. Louis group, Orleans, Orange Co. Ind.
6. " " Chester group, Chester, Ill.
" " Belleview, Michigan
7. " Dalei, M. Edw. Keokuk, Iowa
8 " " Huntsville, Alab.
9 " " Burlington, Iowa
10 " Cliffordana, M. Edw. Buttonmould hill, Louisville, Ky.
11 " Centralis, M. Edw. " " " "
" " New Providence, Ind.
12. Lophophyllum proliferum McChesney LaSalle, Illinois
13 Coal Measures ditto, Springfield, Ill.
14. Lophophyllum profundum, Worthen, Coal Measures LaSalle Ill.
15. " Keokuk group, Buttonmould Hill S. of Louisville, Ky.
16. Cyathaxonia, " " " " "
17. Menophyllum dentiformi, Rgr. St. Louis group Spergenhill, Ind.
18. Axophyllum rude, Coal measures, Illinois
" " " " LaSalla
19. Trochophyllum Verenilli, M. Edw. Buttonmould hill, S. of Louisville Ky.
20. Eithostrotion harmodites, Castelman, St. Louis limestone
21. " Banftense, Rgr. Banft on Pacific R.R.
22. Michelinia ? Buttonmould hill, Keokuk group, S. of Louisville, Ky.
23. " St. Louis group, Huntsville, Alab.
24. Pyrgia, Buttonmould knob, S. of Louisville, Ky.
25. Trachypora Austeni, Worthen- Austin Coal measures, Kansas.
26. Leptopora typa, Winchell, Sedalia, Missouri, Kinderhook group.
27. Conopoterium effusum, Winchell, Kinderhook group, Louisiana
28. Zaphrentis acuta, White & Whitfield, Kinderhook group, Louisiana
29. " calceola, Burlington group Louisiana, Mo.
30. Cladochonus, Keokuk group Buttonmould hill, S. of Louisville, Ky.
" environs of New Providence, Ind.
31. Conopoterium, St. Louis limestone Salem, Ind.
32. Zaphrentis glans, White, Burlington limestone, Burlington
33. " St. Louis limestone, Lawrence Co. Ind.
34. Lophophyllum spind. (or sp. ind.) St. Louis limestone, Salem, Ind.
35. Syringopora ramulosa Goldf. Subcarboniferous limestone, Belleview, Mich.
36 " reticulata, Goldf. Warsaw limestone or St. Louis group, Orleans, Ind.
from Mr. Elrod.
37 " ramulosa, Subcarboniferous Charity Island, Mich.
38 Lithostrotion proliferum Hall, Sub-carboniferous, Belleview, Mich.
39. Zaphrentis Dalei, " " " "

Bryazoa Carboniferous and Sub-carboniferous

1. Rhombopora crassa, Ulr Coal measures LaSalle, Ill.
2. " lepidendroidea, Meek, Coal measures, LaSalle, Ill.
3. " incrassata, Ulr. Keokuk group, Buttonmould hill, S. of Louisville, Ky.
4. Leioclema punctata, Hall, " " " "
5. " " Warsaw limestone, Warsaw, Ill.
6. Palae-oshara, sp. ind Button mould hill, S. of Louisville
7. Eridopora(Fistulipora) Spergenensis, Ulr. Spergenhill, Ind.
8. Axisotrypa, Ulr. Chester group, Bangor, Alab.
9. Prismopora serrulata Rgr. Chester group, Bangor, Alab.
10. Eridopora, macrostoma, Ulr. Chester group, Bangor Alab.
11. Stenopora, Chester group, Joplin, Mo.
12. Eridopora incrusting a Frog coral Chester group, Sedalia.
13. Fistulipora compressa, Rominger, Keokuk limestone, Keokuk.
14. " " Warsaw limestone, Warsaw
15. Glyptotrypa, Ulr. Sagenella, Worthen, Warsaw limestone, Warsaw.
16. Fistulipora, Sedalia from Blair.

Corals of the Niagara and Lower Helderberg Group. Jan. 1900.

Cyathophyllum sp. ind. comperce(?) Caninia bilateralis, Hall, Louisville, Ky.
" Shumardi, Roemer, "
" radicula Rgr. "
" " comp(are) Helioph. parvum, Hall, Louisville & Short Creek, Tenn.
" sp. ind. Short Creek, Tenn.
" " Louisville, Ky.
Diphyphyllum, Niagara group, Louisville
Eridophyllum rugosum, M. Edw. Louisville, many specimens.
" sp. ind Lobeville and Short Creek Tenn.
" dividuum, Davis, Louisville, many.
Omphyma verrucosa, M. Edw. Louisville, Ky. Many.
" Oweni, Rgr. Masonville, Iowa
Ptychophyllum fulcratum, Hall, Louisville.
" invaginatum, Davis, Louisville.
Chonophyllum vadum, Hall Louisville
Anisophyllum Agassizi, Clifton, Tenn.
" trifurcatum, Hall, Louisville
Calceola pusilla Hall, Louisville Ky.
" Tennesseensis, Hickman Co, Tenn.
Petraia Waynensis Safford, Niagara group, Tenn.
Cyathaxonia, Herzeri, Hall, Niagara group, Louisville.
Amplexus Shumardi, Rgr. Short Creek, Tenn.
Duncanella borealis, Niagara Group, Louisville, Ky.
Cystiphyllum Niagarense, Louisville
" compare granilineatum, Hall, Niagara group, Tenn.
" " ", Louisville
Zaphrentis ?, Louisville
Heliophyllum, sp. ind. Waldron, Ind.
Rhyzophyllum proteus, Davis, Niagara group, Louisville
Syringopora fibrata Niagara group, Louisville.
" sp. ind. Drummonds Island
Cladopora cervicornis, Louisville
Coenites verticillatus, Winchell, Louisville.
Cladopora laqueata, Drummonds Island
" " Louisville, Ky.

Cladopora reticulata, many specimens, Louisville.
" " Tennessee.
" sp. ind. Louisville, Ky.
Vernipora, Niagara group, "
Alveolites Louisvillensis Davis, Niagara, Louisville.
Favosites cristatus ? Niagara group, Louisville
" sp. ind. Tennessee
" " Short Creek, Tenn.
" conicus, Hall, Lower Helderberg group, Tenn.
" sp. ind. " " " "
Aulopora, Short Creek, Tenn.
Thecia major, Niagara group, Tennessee.
" Swinderana, Niagara, "
Michelinia lenticularis, Hall. Lower Helderberg, Tenn.
Plasmopora follis, Louisville and Hickman Co. Tenn.
Heliolites interstinetus, Louisville, Niagara group, Tenn.
Halysites, various forms differing in tubes, Louisville, Ky. and Tenn. localities.
Lyellia parvituba, Niagara group, many specimens, Louisville
" papillata, Drummonds Island, Many.
" sp. ind. Masonville, Iowa 1.
Plasmopora elegans, Louisville. Several specimens.
" follis, Louisville, Many.
Alveolites, Niagara group, Drummonds Islands. Many
Heliolites pyriformis, " " . 4.
" megastoma, Hall, North shore of Lake Mich and Louisville Ky.
" " Drummonds Island
Strombodes insolitus " "
Cystiphyllum fragmentat, " "
Amplexus Shumardi fragments " "
Diphyphyllum Huronicum " " 1.
Thecia major from " " and Louisville Ky. Many specimens.
" minor " " " " " " " "
" Swinderana " " " " " " " "
Strombodes pentagonus " " " " " " " "
" striatus " " " " " " " "
" mamillatus, Charlottes Landing. Ind, " " " " " "
Favosites favosus
" venustus
" Niagarensis and many other not accurately determined species from Niagara group, Drummonds Island, Louisville, Ky. and other localities.

Register of Fossils Collected during the progress of the Geological Survey of Michigan

Fossils from the Trenton Group including Birdseye and Black River Limestone

Paleophycus Enc. at St. Jos(eph)
Buchotrphis ditto
Lucrophycus, Billings from Escanaba.
Stromatocerium rugosum, Hall, Escanaba river and St. Josephs Island.
Stromatopora compacta, Billings, St. Josephs Island, Encampment D'ours, Escanaba River.
Receptaculites occidentalis, Salter, St. Josephs Island
Tetradium fibratum, Safford- Escanaba River
St. Josephs Island
Encampment D'ours
Columnaria alveola, Goldf. Escanaba River
St. Josephs Island
Encampment D'ours
Columnaria spec. parvi Encampment D'ours
St. Joseph Island
Petraia profunda, Hall Escanaba River
corniculum, Hall Menominee River
species not clearly defined West of LeAnse
St. Josephs Island
Sulphur Island
Phaenopora multipora, Hall (vid. Foster & Whitney) Escanaba
Stictopora ramosa, Hall Escanaba
St. Josephs Island
Coscrinium (Clathropora) flabellatum, Hall - Escanaba
St. Josephs Island

vide pag. sequent (See page following).

Stictopora acuta ? Hall, Escanaba river.
Stictopora recta, Hall (Esharopora) Menominee River
Encampment D'ours
Stictopora Escanaba river
Stictopora ramosa? Hall - Escanaba River
St. Josephs Island
Encampment D'ours
Sulphur Island
Menominee river, 5 miles above mouth.
Stictopora, nov. spec. Escanaba River.
Phaenopora, multipora, Hall. All those specimens are most intimately connected with the former species. Escanaba river
St. Josephs Island
Encampment D'ours

Phaenopora, nov spec. Escanaba River
Menominee

Coscrinium Escanaba river
St. Josephs Island
Arthroclema pulchella, Billings - Escanaba river.
Chaetetes petropolitanus - Escanaba river
Sulphur Island
St. Josephs Island

Chaetetes similar to ramosus Edw. coarser stems, Escanaba
Chaetetes stems in the white sandstone under the Trenton strata of Encampment D'ours.
Chaetetes branches with spinulose surface - Escanaba
St.Josephs Island
Encampment D'ours

Ceramopora incrusting a Chaetetes- Escanaba
Schizocrinus nodosus stems - Escanaba
St.Josephs Island
Encampment D'ours

Crinoid small diagram and one magnified - Encampment D'ours.
Similar larger specimen from Hudson River group, Bay de Noquets.
Echinoencrinites - Whitefish river
Days river.
Crinoid plates - unknown Escanaba
Leptaena alternata Escanaba river
St. Josephs Island
Encampment D'curs
Sulphur Island
Leptaena cameratu Menominee River
Whitefish River.
Leptaena serieca - Days River
Escanaba river
West of LeAnse, outlier of limestone.
Leptaena filitexta(Streptorhynchus) Sulphur Island(common).
Escanaba river
Menominee river
St.Josephs Island
Encampment D'ours - rare.
Orthis pectinella,Conrad - Sulphur Island
Escanaba river
Orthis plicatella - Sulphur Island
Orthis tricenaria * Escanaba river
Sulphur Island
St.Josephs Island
Orthis Lynx,small - Escanaba river
Sulphur Island
Orthis Testudinaria - Sulphur Island
Escanaba river
Menominee River.
Orthis sub-equata,Conr.- St. Josephs Island
Encampment D'ours
Rhynchonella increbescens - Escanaba River
Sulphur Island
Rhynchonella hemiplicata,Hall - Sulphur Island
Rhynchonella sp. indicand - Escanaba river
St.Joseph
Encampment D'ours
Menominee River
Sulphur Island
Zygospira recurvirostra - Escanaba
St. Josephs Island

Discina Pelopea, Billings - Escanaba
Discina ? St. Josephs Island
Crania - Escanaba
Lingula antiqua - Escanaba
Lingula fragment in the white sandstone under the Trenton strata of Encampment D'ours
with Chaetetes stems.
Lingula, sp. ind. curta, Conr. Utica slate ?
Whitefish river.
Lingula, Lower Trenton - Menominee river
Lingula quadrata - St.Josephs Island
Encampment D'ours
Isotelus gigas - Escanaba River
St.Josephs Island
A Saphus platycephalus, Stockes - Encampment D'ours
Phacops callicephalus - Escanaba
Encampment D'ours
Asaphus ? fragments, drift, Menominee on Sturgeon branch.
Cheirurus pleurexanthemus - Escanaba
St.Josephs Island
Black River limestone
Encampment D'ours.
Bashyurus(or Bathyurus) Spiriger. - Encampment D'ours
St.Josephs Island
Ilaenus sp. ind. Escanaba
Ilaenus - St. Josephs Island, upp er strata.
Calymene - Escanaba
Leperditia - Escanaba
Leperditia canadensis - St. Josephs Island
Encampment D'ours
Leperditia, small - Encampment D'ours
Beirichia - Encampment D'ours
12 Litnites(lithites) upper strata - St. Josephs Island
14 Cyrtoceras Huronense Billings- Encampment D'ours
St.Josephs Island
19 Cyrtoceras St. Josephs Island
15 " " "
16 " " "
17 " Encampment D'ours
18 " St. Josephs Island
13 " Isodorus Billings - St Josephs Island
compare Litnites convolvans Hall Encampment D'ours
1. Orthoceras, sp. indicanda granulosum - Encampment D'ours
St. Joseph Island
20. Endoceras proteiforme - St. Josephs Island
Encampment D'ours
2. Orthoceras multicameratum - St. Josephs Island
Encampment D'ours
4.Orthoceras
(Ormoceras) gracile ? - Encampment D'ours
21 Orthoceras fusiforme Hall, Encampment D'ours

22 Ormoceras tenuifilum ? Encampment D'ours
St. Josephs Island
3.Orthoceras vertebrate ? Hall - St. Josephs Island
Encampment D'ours
5.Orthoceras with preserved colors - St. Josephs Island
6.Orthoceras, small diagram - St. Joseph Island
Encampment D'ours
7. Orthoceras upper stratum. - St. Josephs Island
Encampment D'ours
8 Orthoceras small cylindrical - St. Josephs Island
9. Endoceras Siphons - St. Joseph Island
10. Endoceras vesicules - St. Joseph Island
11 Endoceras longit. striate - St. Josephs Island
Modiolopsis Mayeri, Billings - St. Josephs Island
Encampment D'ours, upper str.
Modiolopsis Gesneri, Billings - Encampment D'ours
St.Josephs Island - Upper and Lower strata
Ambonychia amygdalina,Hall - St. Josephs Island
(Vanuxemia,Billings) Encampment D'ours
Tellinomya nasuta, Hall(Ctenodonta,Billings) - St.Josephs Island
Bivalve, not determined - St. Joseph Island
Cyrtodonta subtruncata,Hall - St. Josephs Island
Encampment D'ours
Cyrtodonta Huronensis,Billings, probably not differing from subtruncata, Hall
St. Josephs Island
Encampment D'ours
Cyrtodonta obtusa ? Hall - Encampment D'ours
St. Joseph
Cyrtodonta cordiformis ? Billings - St. Joseph Island
Encampment D'ours
Cyrtodonta canadensis,Billings - St. Josephs Island
Encampment D'ours
Cyrtodonta subangulata,(Edmond. subang). Hall - St. Joseph Island
Cyrtodonta sp.indicanda - St. Josephs Island
Cyrtodonta " " St. Josephs Island
Matheria tener ? tenei? Billings - Encampment D'ours
Conularia Trentonensis Hall - Mouth of Menominee River
Pleurotomaria rotuloides, Hall - St. Josephs Island
Encampment D'ours
Pleurotomaria Eugenia,Billings. Is said to differ from former by a closed umbilicus
St. Josephs Island
Encampment D'ours
Pleurotomaria subconica - St. Josephs Island
Encampment D'ours
Trochonema umbilicata, Hall - Encampment D'ours
Menominee River
Escanaba
Murchisonia bicinata, Hall (See Eunema strigolata) - St.Josephs Island
Encampment D'ours
Tubulites elongatus Encampment D'ours
St. Josephs Island
Tubulites vittatus Hall (Murchisonia) St. Josephs Island
Belerophon bidorsatus, Hall(Bucaria) - Encampment D'ours

Belerophon diagram of same. Encampment D'ours
Murchisonia, small casts - Encampment D'ours
Cyclonema ? St. Josephs Island
Flat coiled cast - St. Josephs Island
Naclurea(compare gigantea,Hall)
Gasteropode, large flat coiled from fossiliferous strata Escanaba river.
same form from Menominee River.
Gasteropode,conical, large, Fossiliferous strata Escanaba River
(Murchisonia major,Hall)
same form from Menominee at the mouth of river.
Bucania expansa Menominee river near mouth.

Fossils from Cass River near Caro.Supposed to be of Upper Waverley Age.

Spirifer marionensis ? Shumard
Spirifer = punctata shell
Productus
Rhynchonella
Terebratula Eudora ? Hall
Spirigera (Meristella ?)
Rhynchocpira (Retzia ?)
Orthoceras annulato costatum ? (Compare) Meek & Worthen
Syringopora
Fucoides
Lamellibranch, not determined genus. Edmondia ?
Lepidodendron in a sandstone connected with the strata containing the above enumerated fossils.

Fossils from Point of Barques Lighthouse

Orthis, casts of larger and smaller size.
Rhynchonella Huronensis, Winchell
~~Productus~~
Streptorhynchus chemungensis
Spirifer, large,specimens very imperfect.
Syringothyris, very imperfect.
Rhynchospira (Retzia polypleura Winchell).
Spiriferina punctate central septum.(is determined by Winchell as Spirifer attenuatus Hall)
Terebratula ?
Pleurotomaria Huronensis Winchell
Cypricardella ?
Aviculopecten
Schizodus
Proetus
Cyathocrinus

Fossils Waverley Sandstone, Battle Creek, Mich.

1. Nucula Hubbardi.
2. Nucula stella
3. Myalina Michiganensis
4. Solen quadrangularis

5. Solen scalpriformis
6. Saguinolaria similis
7 Edmondia aequimarginalis ?
8 Edmondia sp. ind.
9 Orthonota ?
10 Cyrtodonta ?
11 Avicula
12 Aviculopecten
13 Myalina ?
14 Productus semireticulat ?
15 Productus
16 Spirifer
17 Rhynchonella
18 Spiriferina
19 Goniatites allei
20 Goniatites Marshallensis
21 Nautilus ingentior
22 Orthoceras
23 Cladodus

Diagram opposite above two names

24 Bryazoa not determined

Diagram below above specimen

25 Bellerophon rugosiusculus
26 Bellerophon galericulatus
27 Sanginularia sp. ind.

Fossils Waverley Group Holland

Nucula Hubbardi
Nucula Iowensis
Nucula stella
Sanguinularia ?
Bellerophon galericulatus
Orthoceras
Orthoceras
Nautilus
Nautilus
Goniatites

Fossils from Osseo, Hillsdale Co.

Nucula Hubbardi
Allorisma, sp. ind. Very abundant
Chonetes pulchella W. Is not to be distinguished from Chonetes Illinoisensis.
Bellerophon galericulatus
Orthoceras
Trematopora (an impression similar to one of a stem of Chaetetes rugosus from the Cincinnati group.)

Fossils from Bedford Shales of Berea lower Horizon close to Black Cleveland Shales.

Terebratula ?(Nucleospira ?)
Discina
Rhynchonella
Cyrtodonta. Also related to forms like Megambonia, vide Hall 12th report, besides the concentric wrinkles there are faint indications of radial striae.
Bellerophon, narrow umbilical rounded volutions.

Fossils from Bedford Shales at Bedford Ohio

Cyrtodonta - Berea form.
Rhynchonella, large
Spirifer (Syringothyris type ?)
Productus sp. ind.
Chonetes sp. ind.
Aviculopecten
Ctenodonta
Orthoceras ?(compressed)
Bellerophon

Fossils from Ferrugineo-calcareous strata and kidney iron ore nodules found in the drift in Calhoun and Branch Co. and also in situ in the shales of Branch county which are considered by Winchell to be Huron shales.

Corals and Bryazoa.
Zaphrentis
Polypora, various species
Fenestella, various species
Stictopora
Trematopora, various species

Crinoids
Platycrinus and stems of other forms

Brachiopods.
Productus semireticulatus ?
Productus punctatus Macl.
Productus, sp. ind
Productus, sp. ind.
Productus, sp. ind.
Chonetes Illinoisensis
Chonetes somewhat differing from Illinoisensis
Strophomena rhomboidalis
Streptorhynchus crenistria ? Phill.
Orthis large
Orthis small
Terebratula, Eudora Hall
Rhynchonella
Rhynchonella
Rhynchonella
Lingula
Discina
Meristella

Spirigera lamellosa
Spiriferina spinosa ?
Spiriferina ?
Spirifer ~~disjunctus~~ ? Syringothyris
Spirifer not determined
Spirifer Carteri, Hall
Spirifer setigerus, Hall
Brachiopode not determined
Brachiopode not determined

Lamellibranches.
Ctenodonta bullata n. sp.
" " young ?
" securiformis Goldf.
similar to
" stella ? Winchell
" glabra, n. sp.
" Iowensis
" faba n. sp.
Allorisma not determined genus
Cyrtodonta Billingsii n. sp.
Sanguinolites ?
Sanguinolites ?
Modiola ovum, n. sp.
Myalina Michiganensis, W.
Myalina sp. ind.
Schizodus
Cypricardinia (compare lamellosa Hall)
Aviculopecten
Aviculopecten

Gasteropodes
Platyceras
Platyceras
Metoptoma ?
Pleurotomaria
Loxonemia
Murchisonia
Bellerophon galericulatus
Bellerophon cyrtolites, verp perfect specimens
Bellerophon sp. ind.
Bellerophon sp. ind.

Cephalopodes
Orthoceras various forms
Nautilus bisulcatus, 2 different kinds
Gonietites Allei Winch.
Goniatites Owenii, Hall
Proetus pygidia and cephalic shields,
In all 70 species.
Cypridina

Fossils Sciotoville, Ohio - Cuyahoga Shales.

Zaphrentis
Fenestella
Platycrinus
Productus semireticulatus
Productus
Productus
Productus
Chonetes Illinoisensis ? larger form
Streptorhynchus crenistria ?
Orthis
Terebratula, compare sacculus martii
Spirigera
Spiriferina
Spirifer Carteri, Hall. Compare Spirifer striatus Marsh.
Spirifer setigerus Hall
Syringothyris
Lingula
Discina
Rhynchonella Cooperensis, Shumard
Rhynchonella, small spec.
Aviculopecten compare Indianensis, M & W.
Aviculopecten
Pernopecten Shumardianus
Myalina
Cypricardinia
Pleurorhynchus
Cucullaea
Ctenodonta bullata
Ctenodonta on specimen of Enomphalus
Platyceras
Platyceras
Loxonema
Euomphalus latus ? Hall
Euomphalus higher spire and more cylindrical volutions than former.
Pleurotomaria and another not determined gasteropode.
Bellerophon
Orthoceras
Trematodiscus trisulcatus, M & W.
Phillipsia.
40 species.

Cuyahoga Shales of Different Localities
Medina, Bagdad, Weimouth, Richfield, all in Ohio.

Dyctiophyton Newberryi, Hall
Zaphrentis
Stictopora
Fenestellæ several forms
Trematopora
Forbesiocrinus communis Hall
Platycrinus contritus, Hall
Poteriocrinus plejas, Hall

Actinocrinus Helice, Hall
And several other fragmentary specimens of other species.
Platycrinus graphicus Hall
Productus Newberryi Hall
Productus semireticulatus
Productus, sp. ind.
Streptorhynchus crenistria
Strophomena rhomboidalis
Orthis
Chonetes Illinoisensis
Spirigera
Spirifer setigerus, Hall
Spirifer marionensis
Terebratula, similar to Sacculus
Rhynchonella, small form
Rhynchonella, large
Aviculopecten
Pernopecten Shumardianus
Allorisma Hannibalensis
Schizodus
Cardiomorpha
Edmondia ?
Cypricardinia, compare lamellosa, Hall
Ctenodonta (bellastria similar to) diagram of same
Ctenodonta Iowensis
Ctenodonta Stella ? Winch.
Ctenodonta
Sanguinolites
Sanguinolites
Pleurotomaria, several forms
Natica
Bellerophon cyrtolites
Platyceras
Platyceras
Euomphalus
Phillipsia
Lichas ?
Orthoceras
Nautilus
Cyrtoceras
Conularia Newberryi
Bones of a long fish at Medina

Port Crescent. Strata supposed to underlie the Carboniferous limestone of Wild Fowl Bay and above the Point of Barques strata. Compare fossils of Cass River.

Productus - with productus of Cass River.
Spirifer - similar to Cass River spirifer. Compare also Spirifer Striatus, Marsh.
Spiriferina - similar to Cass River species.
pirigera ?
Rhynchonella
Terebratula
Streptorhynchus ?
Crinoid stems

Rifle River Locality

Orthoceras annulato costatum Meek, similar to vide Illinois report.

Bellevue Carboniferous Limestone

Zaphrentis spinulosa
Lithostrotion mamillare
and same coral in isolated single stems.
Syringopora
Trematopora
Phaemopora
Fenestella
Crinoid stems
Archaeocidaris agassizi ?
Allorisma
Bellerophon
Loxonema
Productus punctatus ?
Productus semireticulatus ?
Spirigere subtilita ?
Psamodus
Cladodus
Helodus

Black shaly limestones in the bed of 6 Mile Creek and of Shiawassee River 7 miles above Owosso. Below this limestone coal was dug out in the bed of the river.

Nautilus, similar to Sagamonensis but larger. Compare Cyrtoceras curtum, M & W.
Orthocerata, large compressed with thick shell
Spirifer cameratus
Platyceras
Bellerophon
Spirigera Sp. ind.
Productus, small nanus, M & W. compare
Chonetes, small, 3 spines on each hinge side
Crinoid stems

Coal measures Williamston

Lepidodendron and ligillaria
Lingula
Discina
Productus much compressed scarcely recognizable.
Lamellibranch shell impressions

Corunna
Lingula
Lepidodendron and ligillaria
Lamellibranch impressions
Modiolopsis ?

Then follows a list of the fossils of the coal measures of LaSalle which were not typed.

Specific gravity of a specimen of brine from the saltwell at Alpena, water taken from the well and bottled May 25, 1874
1,219
Solid contents in 20 grams of liquid.
5,241 grmms.
Nov.8, 1874

For further elucidation of Geology of Niagara group, desirable the following investigations.

a. Tour west from mouth of Manuscong River
b. A tour north along Pine river or along the state road to St. Mary
c. A tour from Lillecoquins lake to the Manistique lakes.

Dolomite forming the upper strata of the upheaved strata at Presque Isle near (Marquette.

Insoluble intermingled silicates	4 %
Alumina and principally iron oxyd hydr.	5 %
Carbonate of lime	55 %
Carbonate magnesia	35 %

Escanaba River, wedge shaped limestone

Insoluble residue	127 mill.
Alum. & Iron	1 % 6.4%
Carb. lime	1776 - 88%
Carb. magn	76 - 4 %

Arenaceous fossiliferous limestone

Insoluble residue	417 - 20.8%
Hydr. iron oxyd with little alumina	48 mill.
Carb. lime	1117 - 55.8%
Carb. magn.	21%

Upper dolomite beds No. 73

Insoluble residue	110.
Iron probable as carbonate in the rock	60 mill.
Carb.lime	1039 - 52%
Carb. Magn.	762 - 38.5%

Limestone containing Orthoceras proteiforme and Tetradium No. 54.4

Insoluble silicious residue	92mill. 4.6%
Iron and alumina only traces	
Carb. lime	1790 - 90%
Carb. magn.	3%

Cyrtodonta limestone

Insoluble	100 mill - 5%
Alumina and iron only traces	
Carb. lime	1829 - 92%
Carb. mag.	2%

Lower arenaceous strata of St. Joseph with orthoceratites and Cyrtodonta. 2 grams

Insoluble in acids coarse silicious sand	972 mill.	48.6%
Iron and alumina hydr.	32 mill	1.6%
Carb. lime	1790	90%
Carb. mag.		2.5%

Upper limestone beds Encampment D'ours, with Pleurotomaria subconica and Orthoceras proteiforme

Insoluble residue silicious	163 mill	8%
Alumina and iron	15 mill	
Carb. lime	1770	89%
Carb. mag.		2%

Middle blue strata with smooth conchoid.fracture.

Insoluble	263 mill.	13%
Iron and alumina	30 mill	
Carb. lime	1624	82%
Carb. mag weighed		3%

Upper Dolomitic beds of Sulphur Island

Insoluble residue	245 mill	12.2%
Alumina and iron	63 mill	3%
Carb. lime	953 mill	47.6%
Carb. Mag.	760mill	38%

Analysis of rocks

1. Dolomite from Mackinak Island at the waters edge some distance north of Robinsons Folly.

100 grains ignited to red heat do not loose any more in weight than about ½ grain to one grain. Insoluble matters in muriatic acid partly and iron and alumina precipitated by bituminous ammonia. All together 2 grains.

Carbonate of lime	55 grains
Carbonate of magnesia	41 grains

2. Dolomite from the Onondaga group at the sawmill on Karp river in St.Martins Bay Not much loss in weight by heating.

Insoluble residue after heating with muriatic acid dark bituminous matter and some crystals of sulphate of baryta, all in weight two grains.

Iron oxyd	1 grain	
Carbonate of lime	53 grains	
Carbonate of magnesia	44 grains	general dolomite composition

3. White coarsely crystalline dolomite from the Fisher hut 1 mile east of Pine River mouth, St. Martins bay. Niagara group.

100 gr. contain

Quartz crystals colorless	1 grain
Iron oxyd and alumina	1 grain
Carbonate of lime	56 grains
Carbonate of magnesia	40 grains

4. Variegated marles from Little Martins Island.
100 grains after boiling with muriatic acid leave insoluble
30 grains of grey colored residue. Give
7 grains of Hydrated sesquioxyd of iron together with alumina by precipitate with (ammonia.
Carbonate of lime 41 grains
Carbonate of magnesia 22 grains

5. Pentamerus limestone immediately below the fossiliferous strata of Pt. Detour Dissolves in acid without leaving any more residue than a slight turbidity of the liquid. Scarcely traces of iron or alumina.
Carbonate of lime 55 grains
Carbonate of mag 42.5 grains

6. Argillaceous limestone interstratified with the gypsum beds of Point aux Chenes.
100 grains lose about ½ grain water by heating.
Insoluble residue after treament with muriatic acid 31 grains
After boiling with carbonate of soda 27 grains
From the muriatic solution by ammonia, alumina and iron are precipitated which weigh after ignition 7 grains
3 grains of the residue insoluble

Silica 29 grains. ----	29
Carbonate of lime	46
Carbonate of mag.	14
Alumina and iron	10
	99

7. Lower strata in the quarry ar Marblehead Drummonds Island labeled 100.

Residue 7 gr.	3 grains
Iron and alumina hydrated	
Carbonate of lime	60 grains
Carbonate of mag.	22 grains
	92

Carbonate of lime heated to much of caustic taste
Analysis repeated, part German and English.

8. Rock specimen marked 109 from quarry at Marblehead Drummonds Island.
Dissolved slow, residue some brown bituminous cloudy light sediment and about ½ to one grain of grains of crystallized white quartz all together weighs 3 grains with the iron and alumina precipitate by ammonia.
Carbonate of lime 62 grains
Carbonate magnesia 32 grains

9. Specimen 107. Insoluble residue 2 grains composed of white sandy parts and dark bituminous sediment.
Alumina precipitated by ammonia with little iron oxyd 4 grains
Carbonate lime 54 grains
Carbonate mag. 39 grains.

10. Quarry point 142.
Residue and alumina with some traces of iron 3 grains
Carbonate of lime 60 grains
Carbonate magnesia 32 grains
95

11. Crystalline white masses imbedded in the lower series of strata at Burnt Bluff.

Carbonate of lime	45 grains
Carbonate magnesia	48 grains
	93

12. Lower even bedded strata at Burnt Bluff. Specimen 73.
Insoluble residue brown bituminous color gr ii
Carb of lime 45 grains
Carb. magnesia 50 grains
(66 gr. phosphate)

13. Upper Helderberg limestone, Blanchards Farm.
100 grains leave 10 grains residue insoluble in muriatic acid.
Small traces of Iron and alumina
Carbonate of lime 68 grains
Carbonate magnesia 22 grains

14. Lingula limestone from Escanaba river.
100 grains contain in-soluble residue 14 grains, a grey colored quartzose sand with some mica leaves and little argillaceous parts.

Iron precipitate	2 grains
Carb. lime	50 grains
Carb. magnesia	33 grains
	99

15. Munising

Insoluble residue	4½ grains
Carb. lime	68 grains
Carb.mag.	15 grains
	87½

Analysis not accurately made. Phosph. of magnesia not given time to separate therefore its quantities must be considerably larger. Probably 25 instead of 15 gr. The rock has also a great specific gravity

123. Analysis from 2 grain calc stone Drummonds Island.Dolomite in contact with Husdon river group.

Insoluble	6 %
Iron and alum.	3 %
Carb. lime	53
Carb. mag	38
	99

Acicular limestone Drummonds Island No. 118

Carb. lime	95.6%
Alumina hydr.	2.3
Insoluble residue	1.6
	99.5

Lowest beds in Drummond Island section No.122

Carbonate lime	51%
" magnesia	34%
Hydr.Alumina & iron	2 %
Insoluble residue	9%
	95
Loss	5

No. 143. Sole bed of Quarry Point Quarry
In 2 grains

Silicious residue	25 mill.	
Hydr. alumina with some iron	25 mill.	
Carb. lime	1177 mill.	- 59%
Carb. magnesia		38%

No. 120 Drummond Island Section

Silicious sand and bituminous matter	2%
Iron & Alumina hydr.	1
Carb. lime	94

Carb. magnesia only very small quantity adhering to the walls of the glass not weighed

Analysis of Dolomitic arenaceous top strata at Munising Furnace
2 grams dissolved, mention(?) of bituminous smell
Insoluble residue principally silicious white sand and some

bituminous matter	126 mill.	- 6%
Iron & Alumina hydr	108 mill.	-5%
Carb. lime	986 mill.	49%
Carb. magnesia	808 mill.	40%

Ditto Munising Coaling Station dolomite
2 grams

Insoluble residue partly granular quartz	74 mill.	- 3.7%
Iron & Alumina	83 mill.	4 %
Carb. lime	1050 mill	53 %
Carb. Magnesia	760 mill	39 %

Dolomite from West Neebish Rapids
2 grams have

Insoluble residue	115 mill.	6%
Iron and Alumina hydr.	36 mill	2%
Carb. lime	1020 mill.	52%
Carb. magnesia	816 mill.	40%

Dolomite from Mud Lake, head of Aux Train River
2 grams have

Insoluble matter silicious quartz sand	480 mill.	24%
Iron and Alumina hydr.	14 mill.	0.7%
Carb. lime	842 mill	42%
Carb. magnesia	684 mill.	34

Dolomite of Escanaba River Specimen No. 47

Insoluble residue	297 mill.	15%
Iron and Alumina	17 mill.	0.8%
Carb. lime	945 mill	47.2%
Carb. magnesia	744.9 mill	37 %

Brecciated Dolomite Rock Escanaba River. Bituminous smell.

Insoluble residue	305 mill.	15%
Iron and alumina	50 mill	2.5%
Carb. lime	980 mill.	49 %
Carb. mag	642.5 mill	32 %

Aux Train River Falls Arenaceous Dolomite

Insoluble quartz sand	297 mill	15%
Iron and alumina	40 mill	2%
Carb. lime	958 mill	47 %
Carb. magnesia	728 mill	36 %

Specimen No. 100 From Drummond Island, Marblehead.

2 grams

Insoluble residue	131 mill	
Iron and alumina	45 mill	
Carb. lime	1150 mill	57.5%
Carb. magnesia	607 mill	31 %

Burnt Bluff Specimen 73

Residue	50 mill.	
Iron & Alumina not weighed, small quantity	20 mill	
Carb. lime	1133 mill	56.6%
Carb. magnesia	700 mill	39 %

No. 39 Whitefish River

Insoluble residue silicio-argillaceous	142 mill.	7.1%
Iron & Alumina, mostly iron	53 mill	2.5%
Carb. lime	1020 mill	51 %
Carb. magnesia	762 mill	38 %

Hudson River Group Calcaerous shaly rock, Bay de Noquets

2 grams leave

Insoluble residue in acids, argillaceous	855 mill	42%
Silic. of Aluminum with some iron pyrites	80 mill	4%
Carb. lime	725 mill	36%
Carb. magnesia	180 mill	18%

Menominee River Grand Rapids Upper Strata, bituminous smell

Insoluble residue silicious	389 mill	18%
Iron and Alumina	63 mill	2%
Carb. lime	925 mill	45%
Carb. magnesia	702 mill	35%

Menominee River Variegated Strata, bituminous

Insoluble silicious residue	465 mill	23%
Iron and Alumina	22 mill	
Carb. lime	840 mill	42%
Carb. mag	673 mill	33.6%

Oolith Menominee

Insoluble residue quartz granules and some bituminous matter	25 mill.	
Iron and alumina	17 mill.	
Carb. lime	1085 mill.	54.2%
Carb. magnesia	839 mill.	42%

Expenses to Lansing and back	4.40
Hotel	3.
At Jackson	1.
Expense for Grinding machine	7.
Fixing Shelfs	10.
Lead pencils	.75
Traveling expenses to Flint and Flushing	2.20 1.10
Meals	1.00
Hotel	3.00
Horse and Buggy	3.50
To Detroit	2.20
To Ann Arbor	1.10
R.R. Friday	2.20
Sum	66.75

Register of fossils Collected 1904 and 1905
Environs of Louisville, Ky.

July 25, 1898 Register of fossils wrapped in papers and labeled.

Lamellibranches.
Conocardium , Stromatopora beds Petoskey
" trigonale, Columbus, Ohio
Paracyclas elliptica,Hall, Hamilton group, Alpena
" lyrata, Conr. Petoskey
Modiomorpha concentrica, Falls of the Ohio
" Helderburg drift.
Grammysia praecursor, Hall, Falls of the Ohio
Pterinea flabella, Conr. Hamilton group, Drift, Ann Arbor
Gosselettia triquetra, Conr. Hamilton group, Drift, Ann Arbor
Limoptera cancellata Hall, Helderberg Charleston, Ind.Ditto Falls of Ohio
Niassa arguta Hall, Hamilton group, Drift.
Not determined casts of shells, Hamilton group Drift.

Gasteropodes.
Turbo Shumardi,deVerneuille, Falls of the Ohio
Pleurotomaria Falls of the Ohio
Strophostylus variaes, Helderberg group Drift.
Various gasteropodes,Hamilton Group, Middle Island Alpena.
Platyceras dumosum Devonian various localities.
Platyceras conicum, Falls of the Ohio.
Platyceras Thetis, Hall, Hamilton Group, Petoskey
" erectum, Hamilton, Arkona
" carinatum, Devonian Louisville
" " Hamilton, Alpena and Petoskey.
" aequilatera, Keokuk group, Crawfordsville.
Platyostoma lineata Conrad, Helderberg group, various localities.

Trilobites
Dalmanites Anchyops Hall, Falls of the Ohio
" aspectans. Hall, Sandusky
" pygidium sp.ind. Louisville
Proetus crassimarginatus pygidium, Falls of Ohio
" " " and macrocephalus fragments Hamilton Group,Arkona
" Haldemanni, Arkona

Tentaculites attenuatus, Hall, Hamilton group Arkone. 2 specimen slabs

June 25, 1891 Brachippodes
Rafinesquia deltoidea, Trenton group, St. Josephs Island, 5 packages.
" alternata drift, Ann Arbor
" " Trenton group Escanaba river
ditto St. Josephs Island
Dinorthis pectinella, Trenton Group Sulphur Island
ditto Drift Ann Arbor
Dalmanella testudinaria, Trenton group Escanaba river
Strophomena filitexta, Trenton group St. Josephs Island
Sulphur Island.

Rhynchonella plena, Trenton group, St.Josephs Island
Sulphur Island
" hemiplicata, Hall, Trenton group, Sulphur Island.
Plectambonites serieca Trenton group Escanaba river 2 packages
Plaesionmya(Orthis) subquadrata,Hall, Trenton group, Sulphur Island
Orthis tricenaria, Conrad, Trenton group, Sulphur Island
Zygospira recurvirostra, Hall, Trenton group, St. Josephs Island.

June 25, 1898
Fistulipora monticulata Ulr. Devonian, Louisville
" " Ulr. Falls of the Ohio
" utriculus,Rgr. Hamilton Group, Arkona
" spinulifera, Hamilton Group, Alpena

Cicularipora, Hall, Hamilton group, Alpena (Scularipora ?)
Coscrinium cribriforme, Prout, Falls of the Ohio
" intertextum Nichols,Devonian and drift,Columbus Ohio
Fenestella, sp.ind. Devonian, Long Lake, Alpena.
Cystodictya sulcata, Winchell, Hamilton group, Petoskey
Botryllopora socialis Nichols, Hamilton group, Alpena
Prismopora, Hamilton group, Petoskey

Aulopora sp.ind. Corniferous limestone Port Colborne
Aulopora Hamilton group, Petoskey
Aulopora conferta Winchell, Petoskey
Aulopora canadensis, Nichols, Hamilton group, Arkone and
Widder
Aulopora ? arachnoidea, Hall,Hudson River group,Cincinnati ectr.
Reptaria stolonifera, Helderberg group, Sandusky
Aulopora ? Hamilton group Alpena.

Dec.9, 1898
Brachiopods arranged in boxes.
Box.1.
Spirifer granuliferus Hall. A large number of specimens from Thunder bay River
Long Lake Alpena
Petoskey
Spirifer varicosus,Hall, numerous specimens,most from boulders found in the
drift of Ann Arbor
Spirifer mucronatus.Very many excellent specimens from Arkona,Canada
several localities Alpena
Petoskey
Spirifer acuminatus one specimen from Falls of the Ohio
Spirifer gregarius, Falls of the Ohio
" segmentus, Charlestown, Ind
" Zigzak, Long lake Alpena
" fimbriatus Petoskey
Columbus, Ohio.
" sub-umbona, Columbus, Ohio
Bartram, Iowa
Drift, Ann Arbor

Spirifer medialis Petoskey
" Oweni, Louisville
" euruteines, Louisville
" pinnatus, Hamilton group, Independence, Iowa
" Hungerfordi Rockford, Iowa
" orestes " "
" macronotus, Pardridge Point, Alpena.

Box No.2

Strophodonta concava, many Hamilton group, Petoskey
" hemisphaerica, Helderberg group, drift, Sandusky ectr.
" demissa
" Hamilton group Thunder bay river
" " Long Lake
" " Widder, Canada
" large, compare concava, Long Lake, Alpena
" Helderberg group, Port Colborne
Falls of Ohio ectr.
" erratica, Winchell, Hamilton group, Petoskey
ditton Alpena
" arcuata, Hall Hamilton group, Rockford, Iowa
" reversa " " Rockford, Iowa
" perplana, " " Alpena
" ditto Charlestown, Ind.
" nacrea Hall " " Petoskey
" " " Long Lake, Alpena ectr.
" fragilis " " Rockford, Iowa
Leptaena rhomboidalis, Helderberg group Drift, Hamilton group Ann Arbor
Tropidoleptus carinatus, Hamilton group, Charlestown, Ind.
Stropholosia radicans, Winchell, Hamilton group, Petoskey

Box No. 3

Chonetes Yandellana, Hall, Louisville, cement rock.
" Syrtalis, Conr. Hamilton group, Drift, Ann Arbor
" Lineata, Helderberg group, Drift, Ann Arbor
" mucronata, Hamilton group, Petoskey
" lepida, Hamilton group, Alpena
" coronata Conrad, Hamilton group, Thunder bay river

Productella truncata, Hall, Hamilton group, Petoskey
" spinulicosta, Hamilton group, Long Lake Alpena
Helderberg group, Drift Ann Arbor
" navicella Hall, Hamilton group, Rainy River, Mich.
Productus dissimilis, Hall, Hamilton group, Rockford, Iowa.

Cyrtina umbonata, Hamilton group, Alpena
" Hamiltonensis, Petoskey
Thunderbay river
Arkona, Canada
Long Lake
Charlestown, Ind.

Meristella nasuta, Conrad Helderberg group, Delaware, Ohio
Drift, Ann Arbor.
Nucleospira, conciana, Hamilton group, Alexander N.Y.
ditto corniferous limestone, Columbus, Ohio.
Rhynchospira, sp. ind. Corniferous limestone, Columbus, Ohio

Box No.4
Orthis Penelope, Hall, Hamilton group Long Lake
" impressa, Hamilton group, Rockford, Iowa
" Vanuxemi, Charlestown, Ind.
Widder, Canada
" lepida, Hall, Hamilton group, Petoskey
" propinqua Hall, Helderberg limestone, Drift, Ann Arbor
Derbya, sp. ind. Hamilton group, Thunderbay river
Terebratula, Romingeri, Hamilton group, Pardridge Point
" Petoskey
" Linklaeni Devonian, Iowa City
" Traversensis, Winchell, Hamilton group, Petoskey
" Hamilton group, Thunder bay river
" Harmonsa, Hall, Helderberg group, Falls of the Ohio
Rhynchonella prolifica, Hall, Hamilton group Pardridge Point
Thunderbay River
" laura, Billings, Hamilton group, Arkona
" Billingsi, Hall, Corniferous limestone, Columbus, Ohio
" Carolina, Corniferous limestone, Columbus, Ohio
Falls of Ohio
Leiorhynchus multicosta, Hall, Hamilton group, Arkona Canada
Drift, Ann Arbor

Box No.5
Gypidula Romingeri, Hall Hamilton group, Long Lake
Phelps Quarries, Alpena
" occidentalis, Hall, Thunderbay River
Petoskey
Pentamerella, arata, Hall, Hamilton group Petoskey
Pardridge Point
" Hamilton group, Middle Island, north of Thunder bay.
" obsolescens, Hall, Devonian, Charlestown, Ind.

Box No.6.
Atrypa reticularis from Alpena, Petoskey and other localities in great quantities
Athyris spiriferoides, Hamilton group, Alpena
Petoskey
" vittata, Devonian, Charlestown, Ind.
Louisville, Ky.

Register of recent and tertiary gasteropods. Feb.1, 1905
Recent
Bulla
Oliva
Chlorostoma
Fusus
Rostellaria
murex

Buccinum Pacific coast
murex
Buccinum
Conus
Turritella
Marginella
Voluta
Fusus Pacific coast
Fusus
Teinostoma
Cassidaria
Natica
Nerita
Dolium
Margarita
Delphinula Pacific coast
Patella, Van Couver Island, 2 species
Columbella
Chiton, several species, Pacific coast
Scalaria
Crepidula, Pacific coast
Turba
Vermiculus, Pacific coast
Cypraea
Trochus Pacific coast
Fissurella "
Calyptraea "

Tertiary

Turritella Eocaen, Alab. several species
Natica Eoc. Alab
Pyrula Alab
Oliva Alab
Bulla St. Hilaryi Alab
Solarium
Nassa cancellata, Alab
Cerithium Eoc.Alab.
Voluta Eoc.Alab
Pyrula cancellata Eoc. Alab
Mitra Eoc. Alab
Oliva dubia Eoc. Alab
Trochus leprosus Eoc Alab
Rostellaria Cuoiri (?) Eoc.Alab
Rostellari Lamarki, Eoc. Alab.
Crepidula arietus, Eoc. Alab
Pyrula Melongera, Alab.
Pyrula Smithi Eoc. Alab
Voluta loc. not known
Voluta Eoc. Alab
Rostellaria Lamarki, Alab
Oliva, Eoc. Alab
Cerithium, Eoc. Alab

July 25, 1905. Register of Fossils collected during my visits in Louisville Ky. in the vicinity of that city.

I. Corals.

1. Zaphrentis ungula, Rgr. Devonian. Numerous well preserved specimens
2. Zaphrentis compressa, Rgr. Devonian. One well preserved specimen and several incomplete ones.
3. Zaphrentis ovalis Hall, 3rd Report, 12, Tab 23. Fig. 1, Devonian, 1 specimen
4. Zaphrentis cyathiformis, Hall. Devonian. Several specimens
5. Zaphrentis elegans ? Hall. Devonian
6. Zaphrentis sp. indicanda, Devonian. Numerous specimens
7. Zaphrentis (Streptelasma) Devonian, sp. indicanda.
8. Zaphrentis gigantea Devonian. Several very large specimens.
9. Zaphrentis (Streptelasma) Sp. indicanda. Large specimen.
9. ditto Specimen similar to the former
10. Zaphrentis spissa ? Hall, Devonian. Numerous fragmental specimens.
11. Zaphrentis undata, Hall Devonian
12. Zaphrentis, sp. indicanda Devonian
13 Zaphrentis (Streptelasma) compare prolifica Billings
14 Zaphrentis (Streptelasma) mammiferum, Hall
15 Zaphrentis sp. indicanda fragments
16 Zaphrentis profunda Hall
17 Zaphrentis sp. indicanda
18 " " "
19 " " "
20 " exigua (Heliophyllum exiguum Billings)
21 Amplexus Yandelli, Devonian, Falls of the Ohio. Numerous specimens
22 Aulacophyllum sulcatum, D'Orbigny, Devonian Falls of the Ohio
23 " ? princeps, Devonian, Falls of the Ohio
24 Ptychophyllum fulcratum Hall. Niagara group, Louisville
25 " sp. ind. Niagara group, Louisville, Ky
26 " ? sp. ind. Devonian ledges directly incumbent on Niagara limestone Louisville. Ky.
27 " invaginatum Davis, Niagara group, Louisville
28 " supposed to be identical with Halls Heliophyllum gemmiferum Niagara group, Louisville Ky.
29 Duncanella borealis, Nicholson, Niagara Group, Louisville Ky.
30 Anisophyllum trifurcatum ? Hall, Niagara group, Louisville, Ky.
31 Streptelasma inflatum Hall ? Niagara Group, Louisville Ky.
32 Cyathaxonia Herzeri Hall, Niagara group, Louisville
33 Onephyma verrucosa, Niagara group, Louisville
34 Chonophyllum vadum, Hall, Niagara group, Louisville Ky
35 Cyathophyllum Shumardi, Niagara group Louisville, Ky
36 Rhyzophyllum proteus, Davis, Niagara group, Falls of the Ohio
37 Eridophyllum rugosum Milne Edw. Niagara group, Louisville Ky.
38 Cyathophyllum sp. ind. Niagara group, Louisville Ky.
39 Cystiphyllum niagarense, Niagara group, Louisville
40 Ptychophyllum sp. ind. Niagara group, Perryville Tennessee.
40 Ptychophyllum Knappi ? Hall, Devonian Falls of the Ohio.
42 Heliophyllum radicula, Niagara group Louisville
43 " radicula (parvum ?) Hall, Niagara group, Tenn.
44 " sp. ind. Niagara group, Louisville
45 " dentilineatum ? Hall, Niagara group, Louisville.
46 " sp. ind. Niagara group, Tenn.

47. Calceola pusilla, Hall. Niagara group, Louisville
48 Heliophyllum invaginatum Hall, Devonian, Louisville, Ky.
49 " cornicula M.Edw. Devonian, Louisville. Adult specimens
" ditto numerous specimens of ordinary size, 2 trays
50 " imbricatum, Hall, Devonian, Falls of the Ohio
51 " sp. ind.Similar to the former.Devonian, Falls of the Ohio
52 " sp. ind. Devonian Louisville
53 " verticale, Hall, Devonian, Falls of the Ohio
54 " infundibelum, Hall, Devonian, Louisville
56 " sp. ind. Devonian, Louisville
57 " sp. ind. Devonian, Charlestown, Ind.
58 " coalitum, Rgr. Devonian Louisville
59 Diphyphyllum apertum,Hall, Devonian, Louisville
60 Heliophyllum nattlerothi, Hall, Devonian, Falls of the Ohio
61 " Halli, Devonian Louisville
62 " sp. ind. Devonian, Louisville
63 " sp ind, Devonian, Louisville
64 " sp. ind Devonian, Louisville
65 " sp. ind. Devonian, Louisville
66 " sp. ind.
67 " sp. ind. Devonian, Louisville
68 " various not determined specimens, Devonian Louisville
69 " not determined specimens
70 Diphyphyllum Archiaci Billings, Devonian Falls of the Ohio
71 Favosites favosus Goldf. Niagara group, Louisville
72 " venustus Hall, Niagara group Louisville
73 " cristatus, M.Edw. Niagara group, Louisville
74 " Louisvillensis,Davis, Plate 9, Fig 6. Niagara Group, Louisville
75 " Emmonsi, Devonian, Louisville, Ky
76 " limitaris Rgr, Devonian, Louisville
77 " auberosis Rgr. Devonian, Louisville
77 b " amplissimus,Davis. Differing by large tube from the former.
78 " hemisphaericus Yand and † Devonian, Louisville
" ditto large specimen Falls of the Ohio.
79 " clausus, Rgr. Devonian, Falls of the Ohio
80 " radiciformis Rgr. Devonian Falls of the Ohio.
81 " small branchelets not specifically determined Devonian,Louisville
82 Roemeri, M Edw. Upper Silurian, Conjepness, Bohemia
83 Alveolites squamosus Billings, Devonian, Drift deposits, Ann Arbor
84 " mordax, Davis, Devonian, Louisville
85 Thecia major, Niagara group, Louisville
86 " minor Rgr. Niagara group, Louisville
87 " swinderana, Niagara group, Louisville
88 " ramosa, Devonian, Louisville
89 Alveolites Stromatoporoides, Niagara group, Louisville Ky.
90 " sp. ind. Niagara group, Louisville
91 Cladopora reticulata Hall, Niagara group, Louisville
92 " serieta, Hall, Niagara group, Lockport, N.Y.
93 " various not specifically determined forms,Niagara group,Louisville
94 Coenites verticillatus, Winchell, Niagara group, Louisville
95 " sp. ind. Niagara group, Louisville, Ky.
96 Cladopora cryptodens ? Billings, Devonian, Louisville
ditto another tray
97 " robustaRgr. Devonian, Louisville

98 Cladopora aspera Rgr. Devonian, Louisville
99 " sp. ind. Devonian, Louisville, Ky.
100 " sp. ind. Devonian Louisville
101 Striatopora Linaeana ? Billings, Devonian, Louisville
102 Cladopora not determined Devonian, Louisville
103 Dendropora, Hamilton group, Alpena
104 Halysites catenulatus, Niagara group, Louisville
105. Heliolites interstinctus, Niagara group, Louisville
106 " macrostoma Hall, Niagara group, Louisville
107 " sub-tubulatus, Niagara group, Louisville
108 " " " McCoy, Niagara group, Short Creek, Tenn.
109 Plasmopora follis, M.Edw. Niagara group Louisville
110 " " Niagara group, Tennessee
111 Lyellia parvituba
112 Chaetetes sp. ind. Niagara group, Louisville, Ky.
113 Syringopora Hisingeri, Billings, Devonian, Louisville.
114 " " Devonian, Louisville
115 " tabulata M.Edw. Devonian, Falls of the Ohio
Kelleys Island
116 " nobilis, Hamilton group, Petoskey
117 " elegans, Devonian, Falls of the Ohio
118 " fibrata, Rgr. Niagara group, Louisville Ky.

Fossils from Hudson River Group - Vicinity of Louisville

119 Columnaria stellata, Hall, Jefferson town
Fischerville
120 " herzeri, Hall, BlackBridge, 10 miles above Louisville
121 Houghtonia Huronica (Columnopora, Nicholson, Calapoecia, Billings) Jefferson Town
Blackbridge
122 Strpetelasma corn iculum M.Edw. Jefferson Town
123 Beatricea, Blackbridge
Jefferson Town
124 Tetradium, Jefferson Town
125 " Blackbridge
126 Orthoceras with calymene senard attached to it. Jefferson Town
127 Agelacrinus grown on the surface of a monticulifera, Hudson River group, Fischerville, Ky.
128 Monticulifera, Sp.ind. Hudson River group, Fischerville Ky.
129 " various forms, Fischerville Ky.
130 Gastropods, Fischerville Ky.
131 Orthis subjugata Jefferson Town Ky, Hudson River group
132 Rafinesquia alternata, Jefferson town Ky.
133 Platystrophia biforata, Schlotheim, Hudson River group, Fischerville Ky.
134 Various fossils from Hudson Rivergroup, Jeffersontown.
135 Beatricea ? Niagara group, Short Creek, Tennessee.

Devonian Corals

136 Blothrophyllum promissum, Hall, Falls of the Ohio. 2 cigar boxes full
137 Baryphyllum verenillianum M.Edw. Charleston, Ind.
138 Cystiphyllum sulcatum, Billings, Devonian. Falls of the Ohio.
139 " sp. ind. [illegible] Devonian. Louisville
140 " latiradiatum, Hall, Devonian, Louisville.
141 " not specifically determined, Devonian. Falls of the Ohio.

142

142 Acrophyllum oneidaense, Billings, Devonian Louisville
143 Fragments of Chonophyllum magnificum, Billings, Falls of the Ohio
144 Cyathophyllum Davidsoni, Hamilton group, Petoskey
145 " sp. ind. Falls of the Ohio
146 " rugosum, M.Edw. Falls of the Ohio
Charleston. Ind.
147 " validum, Hall, Devonian, Louisville Ky.
148 " Zyphus, Rgr. Hamilton group, Long Lake Alpena
149 " sp. ind. Devonian Louisville Ky.
150 " Houghtoni, Rgr. Hamilton group, Petoskey

Brachiopods

151 Atrypa reticularis, Devonian, Falls of the Ohio and various localities
152 Various Brachiopods from Charleston, Ind.
153 Spirifer eurutines Owen, Charleston, Ind.
154 Athyris vittata, Hamilton group, Charleston, Ind.
155 Spirifer acuminatus, Falls of the Ohio.
156 " Oweni, Falls of the Ohio
157 Leptaena rugosa, Devonian, Marion, Ohio
158 Orthis tulliensis, Hamilton group, Long Lake, Alpena
159 Athyris subtilita, Coal measures, LaSalle
160 Productus Nebrascensis, Coal measures, LaSalle
161 Trematospira hirsuta, Hall, Devonian, Louisville
162 Atrypa aspera, Devonian, Rockford, Iowa
163 Spirifer granuliferas, Hamilton group, Thunderbay River.
164 Brachiopods from the Devonian of Louisville

Spirifer Grieri	Nucleospira
" greggarius	Orthis sp. ind.
" varicosus	Terebratula, sp. ind.
Gypidula	Strophodonta nacrea
Cryptonella	Rhynchonella Horsfordi

Brachiopods Niagara Group, Louisville, Ky.

165 Pemtamerus Knighti
166 " oblongus
167 Meristina nitida
168 Spirifer radiatus
169 Pentamerus Nytius
170 Rhynchonella Stricklandi
171 Atrypa reticulata
172 Orthis elegantula
173 Gypidula sp. not determined. Compare Pentamerus ventricosus, Hall
174 Rhynchomella mutabilis
175 Leptaena rugose
176 Spirifer crispus
177 Atrypa interplicata ?