Open File Report XXII

Indexes to Field Notebooks
No. 92 - 368

by
A. C. Lane, L. L. Hubbard, R. A. Smith and many others.
1891 - 1940

Bibliography

Book No. 92. A. C. Lane 1891. Iron County and Bessemer, Abitosse, Gogebic Co. T. 47-48, R. 43-4-5-6-7, All the Sections.

Memo. At the first of the three bridges near ¼ to ½ mile from junction on line from Bessemer, the country (county) rock is exposed in the river, large cut vein. Third bridge looked like granite. A cutting 1 mile W. of Abitosse appears to be sandstone(near a bridge?). W. of Thomaston to Bessemer good work can be done. But east of that place until the 27¼ mile (post) from Duluth so low and swampy that I do not think any good work can be done. From about #274 to where you stopped outcrop can be found. Hyd(e) says there is an outcrop of S.S.(sandstone) near Zula.

pp 1-28 Contain pencil diagrams of outcrop along rivers, R.R. and cuts on the R.R.

P. 118 - Explanation of Numbers and letters used to designate various outcrops.

Book No. 93 Notebook of Field Observations by H. B. Patton. T. 47-49-50-51, R. 37-36-31, Sec. 1-9-21-27-29-30.

pp 1-17 Descriptions of numbered specimens from above localities.

pp 18-20 Description of specimens from Slate River, 2½ miles N. of Arvon.

pp 22-28 Description of Silver Mountain in T. 49, R 36, Sec.1.
These notes are principally of a general character. For detailed description of the position and features of the mountain and for description of the hand specimens see Notebook by A. E. Seaman, Book 85, pp 15 -

Structural Features

On the W. and N.W. the mountain rises gradually at an angle of about 15°- 20°, in places steeper and drops off nearly vertically on the S., and on the E. and for some distance along the east end towards the N. The highest part of the mountain is on the S. side, just about where the N-S section line between Sec.1 and Sec. 6 crosses. At this place the top of the cliff which is about 50 ft. below the summit is 180 ft. above the lowest part of the cliff a little to the east. At this place the cliff is 150 ft. high measured straight down to the top of the debris collected at the bottom. This is about the maximum actual height of the cliff. The cliff has the appearance of being vertical when viewed from the top, in fact it is inclined to the N.W. at about 10° from the vertical. Towards the east end the cliffs are rarely if ever, over 50 ft. high, and the mountain itself perhaps 100-150 ft. high above the surrounding plain.

The Mountain Composed of Lava Flows.

A careful examination all round the mountain indicates that it is composed of a succession of lava flows that have with occasional exception a marked northwesterly dip with a strike about N.50°- 60°E. The thickness of these beds varies from about 40 ft to 10 ft or even under. The amount of dip varies considerably but is not often much more than 15°.

On the South precipice these flows are indicated by lines of amygdaloidal rock. The central portions of each bed are massive or contain only accasional amygdules. The upper portions (generally 3-10 ft) are usually very amygdaloidal, and are also marked by a very rough fracture where long exposed to the weather. The lower portion of each flow is also amygdaloidal but usually not so much so as the upper surface, and usually six inches to a foot are amygdaloidal, above which the rock becomes massive or contains only sparingly amygdules.

It is frequently impossible to tell just where the line of junction between two flows is, but usually it can be pretty definitely located by a jointing line which is almost always present where the junction appears to be. Where portions of the cliff rock have fallen away leaving overhanging portions, this nearly always occurs along the contact line of two flows, the upper, more massive rock remaining suspended.

Ten of these flows were counted and measured on the face of this southern cliff and ; apparently two or three more occur which are marked by amygdaloidal lines but not otherwise well defined.

On the E. and N.E. end of the mountain , the mountain rises abruptly to a height of 70-80 ft or so in three or four steps, each step being composed of one flow. On the N.W. side the mountain slopes more gradually down to the level of the surrounding country, but here too, the flow structure is indicated by an occasional step facing upwards as shown below.

Diagram

The longer gentle slops are very amygdaloidal and represent the upper surface of a flow. The more abrupt steplike portions are amygdaloidal at the top, but massive in the center and lower portions.

(In this part of the mountain(N W.) glacial action is very marked, the surface being deeply ribbed in a N.E.-S.W. direction.)

Occasional exceptions to the regular recurrence of the amygdaloidal portions occur. Once in awhile the dip appears to be in a different direction, and here and there an irregular amygdaloidal portion occurs enclosed in massive rock.

Contents of Amygdules and Character of Rock.

The amygdules are sometimes round, sometimes irregular in shape, and not seldom considerably elongated. As stated above they are abundant along the contact planes of the flows. But in places, especially along the eastern part of the mountain, the rock is almost or entirely free from them. They contain mainly quartz, often in the form of chalcedony and frequently associated with epidote. Calcite is much less common than quartz. Almost everywhere may be seen in the amygdules small specks of chalcopyrite and still more commonly, a dark grayish metallic soft mineral that may be chalconite or lomite?

The rock varies in texture from medium grained to aphanitic, the finer grained varieties being the common ones. Sometimes it appears evenly granular like a fine grained gabbro and then generally has a reddish tinge; more commonly it contains minute clusters of feldspar (or of augite?). These may be seen in the altered varieties but are specially prominent in the fresh dark colored rock from the adit on the south cliff. In general the rock appears diabasic, its color grayish green or when fresh dark gray. As is to be expected, it is generally coarser grained near the center of the flows.

No Sandstone Near the Mountain

The whole country appears to be covered with a deep drift deposit consisting of clay or sandy clay containing a few small pebbles and boulders of gneiss, granite, sandstone, quartzite etc. Into this covering the streams, even the smallest rivulets, have cut deeply- the larger streams 60 ft or over, but nowhere has the cutting uncovered the sandstone which is said to surround Silver Mountain on all sides (?). The nearest place where the sandstone was actually seen in place was some 5 or 6 miles to the N.W. in Sec- T- R- where the West branch of the Sturgeon falls in a succession of low cascades over almost horizontal reddish sandstone. The dip here is northwesterly.

In two places about ½ mile to the west and S.W. of Silver Mountain in Sec.1, the Silver River has cut down and exposed smooth glaciated surfaces of the trap like that of Silver Mountain.

Faults

It is probable that at the place where the adit has been cut a fault line crosses the mountain in - direction. This is indicated by a depression or ravine which runs up over the cliff and crossing the summit of the ridge can be traced several hundred paces down the west side. Also at the adit it is evident that the rock has been greatly crushed along a line following the line of the ravine.

pp 30-32 Sept.2-3,1891. Examination of Slate quarry on Sec. -T.2, belonging to Ayre Estate.

pp 32 List of specimens from Sec.34 and 22.

pp 38-45 South Trap Range. Descriptions of specimens and diagrams of location of same.

Book No. 94 L. L. Hubbard. Iron County. First date mentioned May 11,1894
T 47 -52, R 25-26-27-28-35, All sections

pp 2-23 Angular observations to dtermine position of islands, headlands, etc including diagrams of same. Also description of the trip.(Note from second paragraph). Went to the Fire Centre location on the Dead River. Found a log house and occupied it. In the evening Seaman and I visited the different points nearby where 2 years ago a good deal of money was sunk looking for gold.(p 17).

p 23 Expense account
p 24 Material used
p 25 Men available.
pp 26-27 Diagrams

Book No. 95. A.C. Lane. Aug. 29, 1893. Isle Royal Drill holes.

pp 2-47 Description of minerals found on Isle Royal with diagrams showing locations.

pp 48-121 Description and list of specimens, how marked and where found.
A blue print map in Lanes handwriting is loose in this book.
A Mr. Stockly accompanied as assistant and when his figures are used, they are placed in red ink.

Book No. 96. A. C. Lane Isle Royale.

Opened at McCargoes Cove on leaving Thurs. Oct. 26,1893

pp 1-5 Description of formation of Isle Royale.

pp 6-8 A copy of the "General Description" given by William Ives in the "Land Office Survey of T. 67,33" which follows in full;

This township is all fractional even to quarter sections and is formed of the points of the N.E. end of Isle Royal which have been compared by some to the fingers of a man's hand. There is but little resemblance except in the number of principal points or ridges which form three principal bays N.W. of Rock Harbor and are numbered from that N.W.

These points are Trap rock ridges elevated from 20 to 260 feet above Lake Superior with courses nearly S.W. by W and N.E. by E. and are sloping somewhat gradually on their S.E. sides, and have steep N.W. escarpments with many small broken cliffs the faces of which generally dip N.W. about 80°. All of these principal points are points of points with rock ridged islands continuing from many of them which are narrow and similar in shape and course to the ridges of the points. (Margin note; Made up of smaller L(edges)).

None except the largest ridge is over about 100 ft high and that is from about 100 to 260 ft. high and has a rounded and unbroken outline with a steep N.W. escarpment all of the way and is a continuation of the principal ridge which passes through Township 6 N, Ranges 33-34 W. (Rocks and soil are similar on the ridge through those towns and this).

The rocks of all the ridges dip S.E. by S. from about 10° to 30° and 40° with uneven shales(stratas), 1 to 3 feet strike. The principal splits run about S 60° to 70° N (or W) and 60° to 70° E, running a little obliquely across the ridge and dip N.W. about 75 to 85°.

Parts of the rocks have crosswises or fractures and the largest ridge has them all the way. Many of the rocks are fractured into small angular blocks and some of them are very fine.

The mineral veins are mostly in the splits and are from a line to one and two inches thick, composed of quartz and other veinstone which contains small particles of native copper in many places. The veins on the point between Rock Harbor and the first bay N.W. is an exception to the others.

SOIL. The soil is a few inches to a foot deep and all stony. It is deeper in some of the valleys and is mostly composed of the disintegrated underlying rocks and rated second rate. There is a strip along the foot of the southern slope of the largest ridge which appears to be good tillable soil of sufficient depth to be but little obstructed by rocks. A few narrow swamps also may be made good tillable alluvial soil by draining.

TIMBER. All of the points and islands are thickly timbered with a shortish growth of fir, spruce, cedar, white birch, tamarack, aspen, with a thick underbrush(except on the largest ridge) of Grown (orGreen) hemlock, spotted maple, huge(or high) mountain ash, alder etc. The largest ridge has more white birch than the other points with some underbrush. The largest of the timber is about 12 to 15 inches diameter and the best is the spruce. The timber grows close to the water except on the outer points and islands where the rocks are bare 20 to 150 ft from the water's edge.

The bays are mostly deep. Vessels of any size may enter all of the large ones and many of the small ones and can pass close to the sides of most of the island; and deep ridges were observed to continue from many of the points and islands under water for considerable distances and often near the surface of the water.

Lake trout are to be found in all of those bays and a few brook trout and whitefish.

The variation of the compass needle is fluctuating over the whole township but the most so from the summit of the largest ridge N.W. The extreme difference noted is 5° W. and 26° 40' E.

Mr. Stockly took photographs on this trip.

pp 9-35 Description of Island and diagrams.
p 25 Item. Later workings of Saginaw mine about 10 years ago.
Scoville (Huron mine) interested. Old diggings all along here.
Siskowit Comp. summer of 1892

Historic Data Minong and I. Mine

Vandry worked in #2 Tunnel. Wendigo particular about sets. Poor sets not much. Miner $2.00 a(nd) board. Workmen $1.75 and board. Three shifts did not so much work as one. 7 sets in one month. Me and Smith could put in 7 sets in 2 weeks.

Capt. Jacka at Red Jacket Minong Mine. Nichols 12 years ago. Worked 10-12(8-9).

Parts of sets lean in. 1 less cap < sill. 7'4"High, 5'8 wide.
Chas. Lamoine, Vandry, Johns. 4-5 strike gr.(or qr) copper, fissure vein.
Margin light and coarse.

Mining shaft N. of engine house 800-900 N. pretty on the bluff. Vein in the trap underneath old Indian pit. Vein 1 ft wide, 3ft wide when they sunk 35-40 ft. Lots of copper, solid sheet 3-4 inches in middle of vein.

Sam Brady was at Minong agent. Hodgson took Brady's place. Last one there.

Murdoch Civil Engineer of Island Mine. Drawings etc. Nice little fellow.
Hardy agent of Island Mine. Had diamond drill at Minong 50 or 60' down. Left the bit in right near the (dig or dry?) 200' from it in low ground. Inclined shaft runs S.E. under dig. would have struck this diamond drill 500' or 600' Goes down 100' , then all stoping(sloping to about 300'. Slopes, stopes (or slept) 1:4. Not 100' from surface under old blacksmith shop close to shaft house.

Vandry worked in mine 5-6 years. Worked one winter on dam, in 80 before he---
Listen to hammers underground from dig Jacka.

Saginaw never shipped any copper. There yet (or They get) 2 barrels.
Jolins worked there first.

Saginaw closed down about 16 years ago. The water the island mine stopped.

John F. Johns. Godfrey Vandry. Wm Nimory shot down caribeau and John F. Johns took it on tribute, so much a pound. Some tributers did well. Got 6 ton mass $8. or 9.00 a piece summers work, and lots of smaller masses nearby

Shafer, half way from Minong to Todds Harbor. They wants it on tribute. 15 to 20 tons a winter. Would do better if on tribute. Bill Taylor at Island & Minong and with Hills.

Whitefish Point, L.H. Sam Martin and Chas. Lesage Savagehn at Lake Desor,

LaPointe church 120 years old. Bayfield older.

Silver in Minong. Copper ore, dark(or chunk) ore 4lb.
Worked at Silver Island $40 a Mo. ran out of coal in winter and had to let Silver Islet Mine fill up. Minong mine started '72 or '73.

pp 39-41 Further land description.

Further References to men who developed mines

pp 41-43 John M. Millar 410 Hale St. Escanaba. Had been in Gunflint Lake and Isle Royale region many years. Says Pigeon River has no trout in any of its branches.

Senter, Haley, Eagle Harbor. These examined mine by Quincy people. Capt. Hardy in Wisconsin. Murdoch.
Siskowit. First shaft 500'
Minong - Wolverine. Globular (mine, mill, or drill ?)
Vein 150' (Mined, turned, or wind ?) over 6 miles.
Chas.W. Whittlesey(not Col. Chas), cousin of W.Buyfield (?) 1847. Julius Palmer, fall of '47. Principally by Cleveland.

Dr. Simonson, Calumet 79-80-81.
Clate Davis, Agent
E.W. Hudson, Detroit, Secy-Treas.
Walker of Detroit
Senter, stockholder. powder supplied.

Cleves interested in Island Mine
Mason in Boston Island.
H.E. Cole, Clerk of Island, 2 winters, Minneapolis
Ben Livermore.
Saginaw Mine worked by Saginaw people. Worked by Tein Weston, agent.

C.C. Douglass, father of C.C. on the Island. Douglass and Sheldon.
S. W. Hill
Slate ran fall of '47. Julius Palmer. No axes, sledge and saw to break up wood to get to Isle Royale.

Bernard A. Hooper. 1st tug on L(ake) S(uperior).

Map of K. Point. Stevens, Hill and Williams, 1863, Barnes Phila, K.P.

People to see in Calumet. Dr. Simonson, Capt. Jacka, Nichols. Minong. See Wolverine. See W. shaft on Tamarack, greenstone etc.

Island Mine. Hardy, Deverau, Frank Whits, Mason, Hill. 14-16' foot wall rich about 2' ? and shaft on hanging. Several 100' shaft further W.

E.W. Hudson, Fort St. W., Detroit. ? at Minong. Closed down in '83.
Hiram Walker, president

pp 49 Simonson , Minong Mining Co.(parent) Diff. trails. Copper Co. nearest to cove. Never(or newer) grooved hammers there.

Saginaw closed in 1878. Nesters mine. (Margin note: See Swinford's Report Com. M.S. 1884).

Siskowit Mine stopped late in year. One family left. Husband died, wife all alone, body packed in snow until spring with stuff.

Copper Co. organized when Simonson came in 1879. Works done for 4 years before by Minong Mining Co.

Wm. Stevens, Detroit.
Vivian, Engineer, Calumet ran a tribute Co. a year after regular mine closed, about 1877. Vein or belt 16' wide.
Capt. Uren. Stoping prehistoric (prehnstone) in Isle Royale 30' deep, 18-20' wide. Boulders to keep up the hangings (hangs).

pp 52-53. B. Livermore.
Colonel at Siskowit after at N.W. Soft black trap. Copper only in first floor.
John Foley, Eagle Harbor. Martin.
Hill in 1871 - 1874
Livermore winter 1873 - 1874
C.C. Douglass on Main I. opposite lighthouse.
With Whitney in 49-50 on the way after Geol. Survey a week or two.
Siskowit Mine Dock.
M. R. Livermore Fall 1873. With Prof. Whitney exploration in 1872. Cg. (conglomerate) 29'. No regular pay streak, bunchy.

Isle Royale Land Co. Mason explored west, but got quicksand, never bottomed.

Fall 1871 found the Minong Indian Mine Works. Fissure veins crossing high outcrop of Minong trap.
McCullagh at Todds Harbor 1849-1880 40 men.
Explor. mining in 1872 and in 1873 a Co. organised.

Wendigo.

Topograph evergreens (?) still there. Astronomical station back of Rock Harbor in 1871. 3 men left.

Mt.Cambridge Isle St.Ignace, Rock Harbor, Mt.Houghton, Marquette.

Mr. Owen and Prof. Lytton were on Isle Royale 1858-1859.

Whitney told me he climbed Monument Rock.

pp 39-99 Further description and diagrams
pp 100-104 List of specimens from the Island.

Book No. 97 Geol. Section of No. 3 and 4 Shafts of North Tamarack Mine with Numbers of samples obtained from same.

Book No. 98. A. C. Lane. Summer of 1893. T 58-51,55, R 31,32,45, Sec. 7,12,13,19, 23,25,26,28,30,35. Temperature readings at various hours throughout the localities.

p5. Baseball park mentioned where R.R. comes to Gorge to Atlantic Mill, near the Swedetown Creek Gorge.
p3. Mentions errors in contour measurements on Marvin & Pumpelly's map of Portage Lake.
p6-16 List of specimens.
p18 - Notes on Chassell trip.
p19 - Coal dealers of Lansing. Coal Mining Companies in Mich.
p.21- Notes on Central Mine. Footnote: See Marvin 1 p 185.
pp 24-25, 43-45 Tamarack Jr.No.1, Elevation, Geol.Sec. Specimens
pp 26-27, 41-42, Hancock Station 2-16-94. Elev. Geol. Sec. Specimens.
pp 28-40 Calumet & Hecla, Geol. Sec. Samples in School.
pp 46-49 Tamarack Jr.No.2 Geol. Sec. and List of specimens.

pp 50-53 Mar. 23. with McNair and Stockly. Between Huron Creek and Atlantic Mill
pp 53. June 19,1895. Houghton Cemetery, Elevation and description.
p 54. Test of trap rock from Franklin. Signed Edgar Kidwell.
pp 56-60 Centennial mine, June 1,1894, Geol. Sec. and List of specimens.
pp 62-83 Sturgeon Valley, elevation, Geol. Sec. " "
Note: The Niagara being disturbed by the Keweenaw fault shows that said fault is post Cambrian, post Ordovician, perhaps post Silurian, hence lack of Keweenawan in later rocks. Several diagrams.
pp 92-94 Notes of R.R.Journey Sept.4,1894
pp 96 to end. Abstract of Marvins Notes on Specimens I propose to take from the Eagle river cross section.

Book No. 99 A. C. Lane. Topographic notes Boston Mine, Onota, AuTrain.
pp 1-9 Vulcan mine.
pp 9-10 Mineral Statistics Report 1886. Excerpts as refer to Vulcan at Norway
pp 11 Program of 5th Session of Int. Congress of Geologists, Wash. D. C.
Questions.
1. What is the soaprock? Are igneous rocks near the ores?
2. Into what does the iron ore pass?
3. Are there proofs of concentration?
4. Do the contration(concentration ?) planes follow the bedding or have cross faults anything to do?
5. Do old erosion surfaces determine concentration? e.g. pre Cambrian surface.
6. Is there any sign of Upper Huronian or of unconformities in the Iron Series?
7. Is the limestone really contorted or does the iron fade into it?

pp 12-28 Diagrams and notes on Vulcan and R.R. to it.
Note: At several spots "soaprock" i.e. igneous seams occur.
Temperatures and terminations also given.
p 25. On the hill near Pewabic Mine, trilobites were found.(Diagram on p 24)
Pronounced by C. D. Walcott Upper Cambrian.
p. 29 Ypsilanti, Jan. 16, 1895 Notes of interview with T C Owens
Woodward is surveyor of town; C. A. Nims put down the well.

In Ypsilanti there are three wells nearly in a line N.W. and S.E. from each other. See sketch on p.30 viz; the Owen-Atlantic the most N.W. The Moorman and the Cornwall about $\frac{3}{4}$ of a mile apart. The temperature of the Owen well is 45°. It was put down four years ago. Winchell kept sharp watch of it. He says it is at the edge of the salt rocks(? probably he meant Michigan Salt Group).

Theboys put up a job on him and mixed up his samples but he straightened them all out and they had kept a list and found when they owned up that it was all right. He made a very full record of this well. Owen has a copy. Says the samples and record are at the university but he has a set in his garret too. N.B. Prof. Russell says they are at the University and he will give them to us. At 200 ft. fresh water was got.

At 424 it was very hard rock, no water. They only made 3 to 4 inches a day. 2 ft of this, then a big flow strong in bromides. The total depth is 808 ft. He fed a calf on it all one winter. If you add water to it, it will kill you.(Then follows two marks intended to be poison signs).

Cont'd. At Wyandotte he says there are four wells located as per sketch
Nims put down wells at Marine City and Mt.Clemens Ferruginous Sulphur
About the Moorman well enquire at the Hawkins Fresh
House. The other well is put down by the Mineral Mineral
Cornwall Paper Mill Co.

Sketch of Ypsilanti Wells

Altitude of Ypsilanti M.C. 713', Cor. Pearl & Huron Sts. about 738'
Owen well about 738'
p 34. Sherzus Scofield section where the celestite is found T. 5 S.,R. 9 E, S.18
8' Soil
8' Hard limestone with coaly marls and seams
Porous bed with cavities filled with calcite, sulphur and celestite.
Calcareous sandstone.
There is a spring of sulphur water H_2 S7 in the quarry and the horizon of the celestite. Question: Is this sulphur water horizon at the base of the Dundee or top of Lower Helderberg?

pp 36-37 Altitude observation along Toledo Ann Arbor R.R.

pp 31
Alma News, Alma, Mich. Sat. Jan 19, 1889.
The Sanitarium Well
The following is the record of the Sanitarium well kindly furnished us by T. J. Kelly, foreman for the contractor C.A. Minsus of Ypsilanti.

	Depth Ft	
	60 to	quite sand and water
	157 to	bottom of second sand and through a 3 ft. gravel belt;(this is the depth of the fresh water well, second well) clay and gravel from this point to
Jackson coal group	475	then sand and gravel to
	500	where the bed rock was reached and glass sand encountered. This made 500 feet of 8 inch drive pipe.
	550	to bottom of glass sand and top of shale
	575	to blue shale
	615	to light shale. Here the 5-5/8 inch casing was set in to shut off all fresh water.
	637	White salt sand
	645	bottom of white salt sand
	675	bottom of sandstone, lots of shale and sand
	710	last of shale and top of 2 ft shell, specimens shale,coal,sand and rock
	750	salt sand
	775	fine quality of salt sand
Parma	780	hard shell with white flinty pebbles
	785	shale pebbles and sand mixed
	790,	shale
Grand	825	black shale and sand
	845	blue shale and sand
Rapids	870	blue shale and sand and strata of white lime (note; really gypsum)
	875	blue shale and sand
	895	blue shale and sand with strata of clouded lime
	905	lime shell followed by 20 ft. sand
	940	blue shale and lime
	945	red shale very low (or land)(or sand)?

1015 Sand
1030 Salt sandrock
1085 fine white sand
1100 bottom of white sand, red sandstone
1300 from which point sand drops out leaving shale
1320 red shale to
1500 blue shale or soapstone. The contract was to bore 1500 ft. and that being finishing, A. W. Wright has entered into another. The well will be cased to 1500 ft with 4¼ casing and drilling will continue with a dry hole, a special set of 4¼ tools being used. The object is to reach sulphur water.

From the Alma News vol.1, No.35, Saturday March 30,1894

Sanitarium Well

The following is the strata as noted from 1500 ft. down.

1500 Casing in 4½ shutting off waters
1575 bottom of blue shale and top of fine white sand
1605 changes to black shale
1640 sand shell
1645 soft black shale
1675 sand and shale which continues to
2000 blue shale
2275 black shale
2300 blue shale again
2360 black shale which continues to
2620 hard shell
2650 limestone shell
2660 black shale
2700 black shale and sand to
2750 limestone
2780 blue shale
2800 limestone again, very hard and sandy
2825 white sandy lime
2861 mineral water, temperature 98°.

The workmen who have been drilling at the Sanitarium well for C.A.Nims will be scattered as follows: Thos. J. Kelly will go to Ithaca to put in pumping machinery in the deep well; Wm. Canfield, Morgan P. Oliver and James Seeley will go to the gas field regions where C.A. Nims expects to start operations at once. Mr. Kelley will return here to put in the pumps at the well.

p 46 Barometric elevations around Alma, Jan.17, 1895
Note says; C. A Davis says he has found Mastodon bones within 18 inches of the surface, one set in the muck of a swamp, another by the side of a water hole.

pp 48-51 Notes of Minnesota trip and comparative collection

p 52 Apr. 5, 1895 Well information from Linwood
The crystallized slag comes from pots from the cupola demispherical about 22 in. diameter and 12 in. deep, weighing 325 to 350 lbs. They are better Monday morning. They contain cavities due to shrinking and loss of gas in cooling.

The well sunk in the fall of 1894 took three or four months. It was sunk by one of the machinists. Thep hope that it will flow more after a while. It is cased down only 200 ft. Most of the water comes from 500 - 600 ft. Often sand comes in and fills up well a little. There is a 500 ft. well down at Linwood.

The new L.L. well runs 90,000 gallons in 24 hours. When it is pumped it checks the flows of the old well. The temperature of the water is 46°. The two samples taken are; A, from the sand on the floor of the pumphouse obtained in the last raising of the rods and B, from the tank into which the sand pump worked.

May 14-15, 1895, Near Detroit.

Well No. 1. Put down at Ecorse close to St.Clair R. 275' from canal, 325 ft to bank of river about 1.07 mile from where River road crosses M.C. track beyond River Rouge. Top of well about 2' below level of river. Put down by H. S. Dalton who is authority for all facts not derived from direct observation. He is keeping a record of the well in a tube from which some of my notes are taken. Also promises samples.

Using the fences along the road as sight lines it is directly opposite a point (See map of Detroit) on the Wyandotte road 284 paces or 781' beyond the M. C. crossing above mentioned, or 23 trolley posts beyond River Rouge bridge. On May 14th the well was 500 - 600 ft deep, yielding a very strong H_2S water which H. S. Dalton says is poisonous to every animal that drinks of it.

The record is about as follows; S means sample taken; O about 2' below R. which falls 4 in. in one mile, about 75' shallower than Mulkey's well on the Allen farm.

0 - 75	Surface
11	hard pan
100	Then broken rock coming up in large pieces, apparently a cherty dolomite.
144	Coarse brown dolomite S.S.(sandstone) (or samples)
	Then finer powder
200	Then a darker brown
205	Heavy flow of water. 1st water vein S
	then lighter finer powder and more bluish S
300	
365	S- 8' white sandstone firm and coherent, not caving, composed of white rounded grains of S.
	Sand same as used for glass
423	Then grey quartz sand with rounded grains
	" finer, more gray
	" 4 ft. more rounded sand, reddish, coarser grains
	" 11 ft. red and rusty with white specks
	" 10 ft more brownish; pepper and salt
540	(down to here with 7 in., goes thro 7 in. pipe)
547	" a very fine, dark brown powder
	" a reddish streak
	" a blue grey with white specks
	" a faint reddish tinge otherwise like
	" a lighter colored more dusty

All along from 365 more or less of rounded grains in samples. Angular fragments. (Margin note)

At 518 more limestone
at 547 all lime
At time of visit, about 8ft a day using rods and only one shift. This well is put down for a man named Carter. The River Rouge Imp. Co, the M.C. is behind it.

Well No. 2

H. S. Dalton informs me about exposition building well. It was put down in 1889 for a man named Noble. Geo. N. Brady of Jefferson Av. was also interested. Noble had a tube of samples.(lost). It was just about 1 mile above the well just mentioned.
It began
86' Surface
2 hardpan
60 black shale
At 800 Salt
1100 - 1200 Salt to
1600 principally salt

Well No.3

On map of Detroit, Pt where Dix Road crosses River Rouge. On the Allen Farm. Palmer Bros. of Kansas City, borers. W. F. Mulkey, owner. Bryant Walker represents the land. W. J. Cummings of Woodmere, Wayne Co promised to collect samples and keep us informed. Not 5 ft above River close to road. Not 7100' from river and about 1000' from Bridge Wabash tracks building in, in two weeks. Work suspended temporarily. Is 1000' deep and has passed thro 60-75 ft (85 ft) of salt.

Well No. 4

Riverside mineral springs, cor Fort St. and Clark Av, 28 years old. Pamphlet gives analyses. Depths of wells unknown, the deeper said to be the saltier. Rises 9 ft. above level of ground. Location Q 9, 300 ft. along Fort St., 150 ft. along Clark St.

Dalton bored at Niles 2½ M. up River from town. Boring with rods yields coarser stuff than cable. They found 280 ft. of surface to 180 in the town but it is higher than in the town. The depth was 1600 ft. Yielded low pressure gas. Caved badly from 1100 - 1200 ft and more or less to 1300 ft.

There is a well at Kilmaster with 250' surface, gas at 230'. one well 1300' deep, another 600' deep. Write to C. H. Kilmaster or J. H Kilmaster.

E. D. Church of Church & Co. Trenton, Wayne Co., Mich.
3 blocks N. of city limits of Trenton in N.E.¼ of Sec. 18.

Diagram of well.

P.S. (after diagram) This is no good as they have sent us May '95 a diagram of this location.

They have promised blue prints of their records. Sandstone about 2-300; very sharp top. 550' is a fixed point. The sandstone in their well is said to outcrop of Scofield. Very pure salt, said to be 99.9%, very little Ca, no Mg.

No.1
180 dark brown Li.
280 White sandstone) 290-360 shows sand grains
340 grey streak)
In one well a crack ran down and stopped at 550, i. e. at top of Helderberg.

Michigan Alkali Co.'s wells located from the Main road by noticing where the uprights were in right on a side and diagonal.

A is boarded in, appears to (be) the oldest and is probably the one of which we have the record.

Diagram shows depths from 178 to 382 ft with no description of section. One note says; Just started May 16, sample taken which effervesces vigorously from 70' down there was 60' of surface, 500 to 1000 ft. from water.

The top row of wells B A C are near the center line of Sec. 32, being ½ mile S. of the Eureka Iron Co. well of which we have record which is near S.W. cor. Sec. 28.

Sibleys Quarry (Memory sketch). Fred Sibley

Sibleys is 260 x 11' this side(N) of Churches, and from 100 x 11 ft to 200 x 11 ft from the road across the railroad. The foreman says that it dips 2 ft, 10 in. in 100 and it seems to dip to 2 hours W. of S. say S. 60° W. The top of the quarry is on(or an) to E. D. Church about 35 ft. above river.

Between Ford's and Sibleys is a creek and about half way from the creek to Fords and about ½ mile W. of the road is another well. Said by J. S. VanAlstyne May 28, '95 to be bored by Standard Salt Co on Sec. 31, T. 3 S., R. 11 E. understood (it was kept secret) to be so porous. Salt similar to Ford and Eureka.

Ideal Section at Sibleys

5" At very top, thin bedded birdseye?
8 top gets bluer
8 Very fossiliferous, less cherty, brachiopods
-------- 2nd bench
9 Trilobite pygydinas before, favosites and black seams (coated or cemented) with H_2S ?)
-------- Main floor of quarry
7 Magnesian says Sibley. Most of the fossils taken here. White chert is rich in fossils and is imbedded in buff limestone. Big atrypas, cyathophylloids crinoids, S. depressa, Lineaformus; trilobites, devonian spirifers, etc.
7 Brownish buff limestone, more fossiliferous at top; trilobite, favosites,etc.

Diagram of Section at Sibleys (Memory)

pp 63-97 Quincy mine sections with numbered specimens from same

Book No. 100. Isle Royale and Central Mine. L.L.H.
pp 3-5 Map and cross section of Isle Royale with note stating "the full notes had been copied into Book No.101.

pp 7- 59 Visit by L.L.H. Aug.13-26,1894 to Central Mine when he went underground. Described in details as to levels, sections etc.
p 10 From a plan of Copper Falls and Petherick location by N. Vivian, 1855 the strike of the formation on the N. side of the greenstone ridge opposite the Central mine is N 70° 51' E. Includes list of specimens.
pp 60-75 Copper Falls mine, Geol. Sec. and samples
pp 109-119 Altitudes, Barometric readings from Central mine, Mineral Range R.R., Eagle River, Eagle Harbor and Phoenix mine.

Book No. 101 The notes in this book are copied from Book 100 with complete details filled in, covering same location.

Book No. 102 pp 1-67 Diagrams and descriptions of outcrops on T 51, R. 35, Sec. 13,14,22,23,24,32.

pp 67. Reasons for belief in having found a large iron outcrop in Sec. 32
pp 108-119 List of specimens from there, June 8(no year given)
p 120 Expense account. (Book in handwriting of L.L.H)

Book No. 103 Sept. 17,1895 to Oct. 5, 1895
Barometric Observations and computations by A. C. Lane with maps and diagrams Isle Royale.

Book No. 104 T 58, R. 29,28, Sec. 24,19,29,30,31,32,28,27,23,25,26,35,36
p 1. Apr. 29,'95. L.L.H. Trip to Copper Harbor by way of Central mine, Delaware and Ahmeek locations, Phoenix, Mt. Bohemia, Beta Grise Bay, Little Montreal River thence to Agate Harbor and Copper Falls, May 15th returned to Houghton. Examined outcrops at these places. Wm. J. Sutton, D. C Forbes and A. E. Seaman in the party.
p.4 Specimens from near Stamp Mill, Lac LaBelle
pp 5-17 Specimens list with diagrams showing locations.
pp 18-19 " " " descriptions at Fish Cove.
pp 21-118 May 12,'96 to July 12,'96 Locations, descriptions, Bar. readings, diagrams covering Mt. Bohemia, Mt. Houghton, Mendota, Little Montreal River.

Book No. 105 T 57,58, R 28,32,27, Sec. 35,31,16,30,19,20,21,22,25,26. L.L.H. Apr. 23, 1895.
A letter from Fred Smith, Agt. Allouez mine, stating dip is shown wrong on map. Cross section of bore holes at mine.

pp 8-51 Description of remainder of territory not covered in book next above (104) with specimens, diagrams and Bar. readings.

p.45 Page on Felsite.

pp 48-49 Article on conglomerate.

pp 53-97 Examination of Felsite and conglomerate exposures along shore in Sec. 29-35 and 36, with specimens and bar. readings.
pp 98-99 Schlotters Lake. Description of roads and terrain
pp 102-109 Keweenaw Pt. Sept. 1896. Description, diagrams and list of specimens.
pp 110-116 Complete list of specimens from Aug.7,1895 and later.

Contour map of Beta Grise Bay on fly leaf in back.

Book No. 106. A. C. Lane. T 58,66,65, R. 28,34,35,36, Sec. 20,23,26,27,29,4,33,34 5,6,7,8,15,29,11,35,
pp 1-14 Continuing along shore in T.58
p 15 Program for Isle Royale trip 1895
pp 15-22 Finishing up and preparing to go. Enter Reliance Mine Sept.17,'95
p 22 Arrive at Rock Harbor.
p 50 Had to go to Duluth on account of foot.
Balance of book contain traverses of the island with diagrams and bar. readings.

Book No. 107 T. 58, R 28, Sec. 19,20,21,22,26,27,29,35,36.
Frederick P. Burrell to p. 66 R. T. Mason
Geol. sections of above with locations. L. L.H. made many corrections in the locations.
p 120. Expense account.

Book NO 108 Notes by C. H Gordon T. 58,59,57, R. 28,27,29,31,32, Sec. 19,20,26, 27,29,35,9,17,18,4,6,9,12,32,23,17,24,28,31,11 Dated Aug 9th.1895
Entire book description of outcrops with diagrams of location of same and Bar. readings
pp 54 - end, notes of C. F. Moore.
On fly leaf in back under date July 11,96 an expense account.

Book No. 109 T 58, R 28, Sec. 27,26,28. R. T M. assisting Dr. Gordon in contouring lines in parts of above sections and Meanders of L. Montreal R.
Levels, contours, locations etc.

Book No. 110 Isle Royale . Altitudes from lake level George Wallace and D. C. Forbes, compass men. Entire book on Bar. readings, and locations, with diagrams.

Book No. 112 Lane and Hubbard Carp River Coles Creek T 56,54,55,51, R 32,34,35,42,43, Sec. 20,11,16,34,36,15,27,22,24,25,14

p 1. Traverse table explained.
p 2. Diagram of altitudes
pp 3-4 Description of Bicycle trip to Atlantic Mill

Nov. 22,1894 Dr. Koenig says that Huron(Houghton village) spring water contains 100 per million solid matter. That it is like the Quincy mine water both having rather peculiar waters. The Quincy mine water contains 35 pints per million of $CaCO$, and Na_4SO_4. Reduced to half its bulk it reacts alkaline. There is no free CO_2. That the clay of Dr. Jones potato patch contains much potash and hence is a decomposed porphyry

pp 7-21 Observations made by L.L.Hubbard along Ontonagon Road, Six Mile Creek, Atlantic Mill, Coles Creek, Canal road W. of Hancock, Domeykite vein , Isle Royale location at East Houghton and Franklin Jr. mine.
pp 110-111 Key to numbers used to describe outcrops

Book No. 113 Prall. Salt water and brines. Hein analyzed coal for the T. S. and Huron R.R. Peters. Webber. Higgins Albany, Hodges, F & P.M.
Analyses of water of Wm. Hicks Saginaw, E.Side.

Total		192.5
	CaO	11.5
	MgV	5.1 as pyrophosphate
	SO_3	28.8
	Nacl	118.7
	Si	.5
Total hardness		190

Tom Whittier uses waste of waters for making dry batteries.
Gould, Deputy Salt Inspector
Coats of Kalamazoo makes analyses.
G.W. Hill 106 S. Warren St.
E.S. A. F. Bartlet & Co. 930 S. Tilden
W.S. Jackson & Arm 300-314 Cleveland
p 2 Pinned in Analysis of water from Saginaw Wash. Ave. well, 73 gr. to gal.
Brand & Hardin 61.50 gr. to gal.
p 3. Sebewaing Coal, heavy smoke. Sulphur not so high as Kincaid
Not good curbstone in E 679½ and 11
Native copper at Bayport Quarry, Reid Mch Co. 1887
Mass about 2 or ? copper from A.H. Wallace with this mem. Found at Bay port Quarry between Int. and No.1 (or drift and No.1) i.e. on lots of rock at bottom of shipping. North I. - Spooney I.
Land Survey - Fishing Point. Coast Survey - Sand Point.
Kateschart ? Maison - Warner I.
Large granite boulders around Heisterman Island . No.1 Large, not uniform in chemical analysis. One analysis has been given.
Iron ore in Sec. 2, 16, 9
Port Austin 1004 was just putting down a well.
Dr. Small 903 Court St. 6½ gr. liter of mineral water with faint reaction for Cl.
S.23, Albee T. Brack and Pardridge were working 16 men.
Test hole 58 ft. deep Brack and Pardridge 55 ft.
Brack says coal plays out ½ mile E. and also near the line 23/24 going west.
They want a spur 2 miles to C.S. & M. can ship 100 tons easy, only working 8 hours a day. This mine store makes 25% profit less expenses. They get $2.20 a ton. The coal cokes.

pp 5-15 Wells reported by Wm. McMillan around Saginaw Dec.16,1895.
Schemm Brewing Co. 926 W.(N) Hamilton W. Saginaw.
104 ft. to rock cased to rock.
40 good water
50 ft off N.
108 to rock
208 blank shale dry
Nice salty water, no SS

Barringer
105 to rock
26 sandrock

E.G Rusk's farm about 2 miles W. of W. side from City limits
112 ft. water, gravel and sand
½ Mile N. at the buildings
266 ft. 5 in. well
163 ft to rock shales and
5 ft. brackish water. Sandstone at bottom

Bancroft House
131 ft to rock
7 ft sandy shale. water as tested

Diedrich, next block N.
96 ft. deep. Water plenty. About 80 ft of clay here, i.e. in East Saginaw.

Robert M. Randall ½ mile S. of Bancroft
1 to 6 in well. 139 ft deep. 132 to rock.
7 shattered sandrock at bottom.

Cass River, John Welch
4 miles S. of Bancroft House 4½ in. well
273 ft. deep
85 to rock
248 1 foot of coal, rest mainly shale except hard sandrock at bottom

City Well
1 mile out on Genesee & Hoyt St. 4½ in. well, 111½ ft deep
78 ft. clay
22 hardpan
7 mud and gravel
4½ water gravel.

Curtis Well 4 miles W. of 16, Midland Co.
53 feet deep, all hardpan, no clay, flowing well yielding ¾ barrels a minute with loose sand at bottom.

Coleman, Midland Co.
276 ft. deep, 4½ in.
72 ft. hardpan
204 all quicksand same. water within 20 ft. of surface

Alabaster, Iosco Co.
436 ft. 2 in. flow starting in rock probably 36 ft of sandstone at bottom. The water looked like seltzer.

Fairgrove
Rails at Fairgrove are 80 ft above Saginaw R. 388 ft 10 in. deep
103 to rock
160 ft. cased to shut out bad water, some sandstone and limestone
31 Water bearing sandrock at bottom . A good stream water rising to the surface with a small flow. Which is it P.112 Bk 76, 345 or 680. probably the upper because good water?

Saginaw, Brand & Harding Flour Mill
90 ft deep, water, sand and gravel, used for mill boilers.

O'Donnel & Spencers Well (6 in) on Genesee St. 179½ ft.
72 ft. clay
43 hardpan
4 black shale
1 coal
2½ soapstone
2½ coal
45 soapstone
3 hard sandrock
6½ water bearing sandrock

Saginaw City ¾ mile off on Michigan Av and Clark St. 4½ in well
142 or 145 ft deep.
75 ft clay
6 mud and gravel*
10 hardpan
51 coarse sandrock. Best water in Saginaw.

Flushing, Dr. Williams 115 ft deep
65 ft to rock, very bad hardpan, full of boulders. Waters in sandrock and good supply.
End of Mc Williams Report

S. G. Higgins of Saginaw will give records of fifty holes. Lots of coal explorations.

Mr. Lemke of A.E. Bartlett & Co. noticed that the Blackman well which is a flowing well and briny, gave off gas, and catching some in a funnel, it burned.

Mr. Thrasher invites me to see City Water Works.

Tom Whittier says his farm has about seventy-five samples of subsurface soil down to 6 ft deep. Taken with an auger from Gladwin Co. in T.18,19 and 20 N R. 1 and 2 E. It was generally wet at the bottom of the holes. See p. 14.

Brine properly pumped in Saginaw runs 92° sal but when they all were pumping it ran down, down so that instead of taking 11 seconds, it took 20 to fill a quart pail. N.B. Prepare a conversion table of lead and flow. Wells must be kept tight otherwise they cement up ? Ives air make Fe_2O_3

Bay City. E. Halls well has belches of gas.

Saginaw. The Bancroft House well is getting saltier from the overflow at Eddy's.

Coal in Gladwin Co.

pp 15-17 Whittiers make 90,000 bbls of salt. tried to stop outflow of money in regalvanizing pipe, which used to cost 13¢ a foot, and $1200 - $1500 a year. It requires some injury to pipe to start galvanic action, which injuries were usually incurred in hammering off scale.

Thus Whittier got interested in electricity and began to experiment on galvanic batteries with the waste liquors. He made a battery yielding an ampere with 1.65 to 1.57 voltage, the fluid being made from mother liquors. 20,000 gallons of mother liquor were produced every 24 hours and from one pump he managed to produce 6 precipitates. The claim of his patent is for an excitant for galvanic batteries composed essentially of the residual salts of natural brines. He made his batteries out of three slabs pitched inside and very cheap.

pp 19-30 Wells around Bayport and in Huron Co.
At Port Austin there is a well which is ½ mile from shore and yet the water is roily when the lake is stormy.

Eagle Bay Is E. near grindstone quarries
24 sandstone
30 soapstone
24 sandstone
rest shale

100 yards away is another well with coal.

Names of Eagle Bay, Point aux Barques etc changed by sailors.

Miscellaneous information

The country along the S.T. and Huron is very flat. 10 ft. drains

I met Supt. Wallace of Bayport quarries. Gen. Man. Rosenfeldt.

A story about a stone wall about 5 ft wide found in a swamp in Sanilac and Tuscola counties that needs to be looked up.

Oakland Co. Walled (note the name, how walled) Lake is 3 or 4 miles E. of Wixom on F. & P.M.

From L.P. Mason's well it appears that the Bayport quarry limestone drops off in a bluff.

Bayport 2000 ft. sal. John Coryell, pronounced cor-yell.

Rock outcrops on the S. side of Sec.11, T. 16 N., R. 9 E.

Look up wells around limestone quarry, it drops off suddenly. Wells at the house and office drop off suddenly.

Small diagram

The elevation of surface of quarry is 51-52 feet above lake, and the Bayport sandstone is 15' above cyathophyllum as per samples abundant between 4 & 7. Chert nodules just below and in 2. Only beds 1-5 of the diagram shown in quarry it appears to dip to N.W. The roll is said to be more to W. and not very great. Pinned in diagram. #1 has been analyzed and published. Other analyses.

Ridge at Bayport Junction runs around the point and into lake ½ mile below Grindstone City.

Board costs $4. a week. Ask fishermen about ledges.

Bad Axe. is 176 ft. above lake, no higher land around (later note; not true July 1896), yet there are flowing wells 400 ft. deep. Where is the head.

John Coryell, Bay City should be written to and seen. See interview Book 124.

Glassmere, 6 miles from Bad Axe.
178 ft. deep 2 wells
40 earth
excellent soft water
at 158 coarse grey sandrock.

Elkton . 2-3 wells for engines.

Fish Point. Coal. On 4th of April 1885, tidal wave deluged the road and washed away the track.

Caseville. drift
pink gypsum
sandstone

Bridgeport. Beech says the well varies with the wind.

Report of John Pearson

verbal

35 Brown City Wells 12-25' deep
5' quicksand
big stone, land flat
hard clay
layers of stone
45 clay
5 quicksand
clay
2 stone
hard clay
stone
seam of water

written

F.& P.M.R.R.
45' 3 stone and clay
40 gravel, spots of cement gravel init, then coarse and light sand under it.

Here in Saginaw Valley all about
16 mixed clay
65 blue clay through whole valley
75-80 get hardpan. There is often a strong stream of water just below clay but it is shut off for fear of clay.

Yale Station. F. & P.M. hard blue clay

Port Huron Junction. 75 ft. deep
70 blue clay, large stone and water, and blue clay under. Dug 4 ft. in diameter.

Mr. Linton at 73 ft. awful stream of water see p

Baldwin(cant find on present maps - Abbotsford ?)
100 to rock, mostly clay
200 bluish rock to oil
at 70 ft was another splendid bed of water with blue clay below.

Pinned in Pearsons records

We have also a report to the Board of Trade in Saginaw regarding a number of explorations by S. G. Higgins, May 1, 1894.
Also Webber has promised copy of original diagram of E. Saginaw well, and has also loaned us section of Bayport quarries.

The Big Rapids is much like the Stassfurt brine.

p. 32 Discussion about using salt waste as a disinfectant.

Dr. Elvin Waller of New York City, formerly of Columbia, used bromine solution for sewage disinfection.

Mr. Geo. C. Whipple, biologist of the Boston Water Works invented the thermophone. Chemist, St. reservoir, 242 Chestnut St. Chelsea.

Mrs. Richards of the Mass. Inst. of Technology says the bromine problem is a mechanical and practical rather than chemical. Chemically it is simple enough. After evaporation until $CaSO_4$ $NaCL_2$ i.e. are thrown down the mother liquor is exposed to chlorine gas either generated separately or by adding $MgSO_2$ and HCL to the solution, Mg salts interfere and cause a mexture of Cl and Br unless great care is taken. Then the bromine is distilled off. She thinks the manufacture of amide disinfectant might pay better.

References and diagrams to Frank Patent 1877 D.R.P. #2251
Hoffman's Bericht uber die Emtro. 127-136
Handbuche Tech.-Chem I . 2003

pp 32-33 Miscellaneous notes which are typed in full.

Apr.9,1896 At the Sault St. Marie. Met Mr. Wheeler, Mr. Sabin, Mr. Mandelsdorf. have measured dip of SS very carefully. Steepest dip is 20° N of rims (?) of canal. Those markings they are going to ? photographs off note the clayey seam(?) in which they lie .

Arrived in Detroit. $2.50 room at Wayne as no $2.00 was vacant. May 15,1896 met Mr. Houghton. With him called on Mr. Belknap concerning Isle Royale. Obtained two copies of bylaws and last report. Porter Hitchcock of Pontiac has charge of sale of Minong. Chas. Garrison and Davis got up a report. There was once a cabinet of specimens. Sam Brady, Mr. Morse of N. Chicago, E.W. Hudson (paralyzed) H. Walker were interested.

(I type the following notes from a loose leaf insert as they have some other information). Notes of conversation with Mr. Belknap on Woodward Av. Porter Hitchcock has charge of sale of Minong. The Cove Land and Union Co. has about 4200 acres sold, 1400 acres (the middle part)(?) to Minong Mining Co. Sam Brady was agent. Mr. Morse of N. Chicago was prominently interested. E. W Hudson is paralyzed. Drake. Hiram Walker. Chas. Garrison and Davis got up a report. There was a cabinet of specimens went somewhere ? much silver. Houghton means to explore on fissure vein thro hole #5, has a 2 yr. option from Wendigo Co.

Windsor Salt Wells, look up.

Detroit Salt Co. Will J. Cummings #1296 4 rings
Clinton B. Wicer (M. C. Bullock) Delray. Map $1.50 John H. Plummer.

May 16. Saturday. Went to Belle Isle and with Holmes called on Sam Brady. 2½ % in stamp rock of Minong.

May 17. Sunday. Visited sand pit S. of Ypsilanti.

18. Visited Normal School and made appointment with Strong. Saw his pamphlet and photographed his fossils from Grand Rapids, also Cummings map.

Sherze says Winchell's "competent assistant investigator" may have been Miss. Patterson.

Thursday May 21. In Alma and St. Johns. Harrington House has flowing well 37-40 feet deep. 5 pints in one minute at surface T. 51½° F. about level of town. A new deeper well is being put down by Wm. Brock of Bay City.

Magnetic Mineral Springs (about 200' deep) have a large flow T 50½°. Chalybeate water close to river bank. Bar. 728.

Waterworks well (about 175' deep) rises to B.750, T. 52°. The river is about 30 ft. below their level.

The salt well was about 1300' deep and bromine was manufactured about 1883-4, 7-8-9 to 10 years ago. Near by the hotel well one 50' deep. Col. L. Saviers and Mr. Carr gave information.

The city water works 175' well affected the small wells lowering the head perhaps 1½ ft. The salt well tubing was rusted in. They used to make 40 bbls a day of salt.

Friday May 22 in Saginaw meeting Webber Crapo. Near Rush Lake a stone quarry Sec. 15. Mr. J. William Babbit, Ypsilanti. HAnnah H. Sebewaing.

Sat. 23. I took morning train to Bad Axe 7:05 A M. B. 2967 at 61° F . At 8:30 P.M. B.2289. As we pull out the country is flat and even the drains 3' below general level. There is a very gentle rise with no break nor terrace. B.1305. cross stream in 10' gulch, the divide must be close to it on W. side. Rise of land flat, the land sloping gently and uniformly. There is a sand and clay pit near Reese. B. 1395 at 8:50. There is a little ridge a mile or so S. of Reese. Ditches have water level 3' below track. B.1315 at 9. A.M.

Fairgrove. Cross stream in narrow valley 15 to 20'

Akron. Just before we got there shallow stream 10' below, not very broad valley, very faintly undulating. 5'. Topography so that ere long the R.R. goes through a sandstone cut and pit. Along here we have a flat, mucky clay plain with occasional clay islands, flat but woods or highlands to W. B.1292 at 9:30. Drains 10' down, rather broad valleys, banks steep in spots 6' to 7'. Gradual slope to shore, sand ridges 4' high rising from general plain. Sebewaing very flat, level of lake muddy S. of town.

Webber says flowing wells run dry when pumped out shafts. One well S. of town deeper, somewhat salty for stock. Water of town flowing wells from gravel immediately above rock. The irregular sand ridges shown by change in soil in stream near Bayport outcrops. Webbers says farmers used to gather it in summer and cart away in winter. Supt. of quarry dug a hole 20' square. Long dune on beach lines from junction to Bayport. B.1255. Sand near Bayport Junction, well marked, rising to E. of track 15' high and clothed with jack pines. B.1260. 3' culvert near sand pit with a sidetrack. B.1265 at junction ? .10.

Top of sand ridge 8-10' above track and higher than county behind. The R.R. m makes a shallow 2' cut through limestone at quarries.

Webber says" in 1873-4 a well 2000' deep was put down at Bayport for salt. Failed soon after. Then he bought the property. John Coryell put down well. Got him to recase. When well was originally put down at certain distance 500 - 800' so strong a flow as 32' head. At present about 10. Webber had it stopped at 750' but it was still salty than at 550 and though it was strongly mineral it was not salt.

Pigeon R. has a narrow valley. The R.R is at main level of land which is flat and even clear to Elkton with clay soil. Lots of wells around Pigeon.1216 down to sandstone.

May 23. Now going down. Andrew Nerby 2½ miles E. and Emmerslich 1½ W, 4 S. ½ E. Mr. Challis is near limestone 1 S, 1½ N. ½ W. These instances are all in miles from Pigeon.

Elkton. B. 1310. Beyond Elkton some pebbles in fields. At Elkton brickyards, light brick. Limestone pebbles are a fault. Are harder than those made N. of Bad Axe.

Grassmere . Stream L 10' below just a few yards N. of road. Beyond Grassmere undulating. Just as we get into Bad Axe gravel or sand ridges.

Indians made lead ?? See clipping. Near Gagetown is a curiosity collection.

Monday May 25. Gypsum samples. Mr. Webber has several from Hurd Co. which look like loose boulders, some from N.W. of Bad Axe.

In regard to drill hole #1 of which we have blue prints of the first 37, one of Webber's men tested by burning some of the cement rock then cementing two pieces of sandstone letting it set for a day. Then leaving it 6 days under water. The pieces still(May 23,1896) cohere while pieces similarly treated with Milwaukee cement have long ago separated.

In drill hole #1 of the Bayport set from 25'1/3 to 29' dipped decidedly according to diagram about 6;11. The rest had practically horizontal stratification. (N.B. of what we saw on Chantz ? I.

No.1 is in quarry about 1050 N. 800 W. Sec.5, 16 N. 10 E.
2 " " 1900 1350 " " "
3 At the bay near W. line of E.½ of S.W.¼ of Sec.36
1500 W
4 Taylor farm 900 N 250 Sec. 35, 16 N., 10 E.
No.1 48.2 ft. above level of Bay in 1884

16 limestone and miscellaneous material as per detailed record of quarry
20 grindstone or coarse sandstone
13-15 fine sandstone red, brown, or brindle S
50 Slate shale etc S

No.2 42.5 above level of the bay.
13 limestone similar to quarry, last few feet a mixture
24' sandstone
4 soft fine sandstone
7 slate and sandstone mixed

No.3 20.47 ft above bay level
4-1/3 firestone see LXIX
3-2/3 limestone Bayport upper well
15 sandstone (sample grey white and g(rey) impu(re) Kaolitic
4 sand and limestone
" " light cement
shale and sandstone
23½ shale and occasional mixture of sandstone.

No.4 11.16 feet about Bay level
10½ like #3 at Bay and to Stone in R.R. cut(used by early settlers instead of fire brick for lining their arches, hence the name firestone.sandstone).
15 sandstone.
8½ Superior coarse sandstone. 1½ shale
7 Whetstone (fine) or hone. 4½' shale.

Webber has letter showing % of core saved but according to letter of Supt. S. Shen, May 25, 1884 the per cent of core saved depended on the number of revolutions to the inch 700 or 300, e.g. at 28.3 core saved was 18.4. A portion of this loss from earthy deposits between layers. ✱ Uren ½ core in grindstone lost, due to greater wear of comparatively soft stone.

pp 40-43 Data on coal borings about Sec.3-15, R.8-9, Reported by Webber Given in measurements

p 44 Diagram Altitudes on Sec.5,16 N, 10 E.
Tuesday May 26. Samples in Mr. Webbers office
Greyish white impure sandstone such as occurs on the Shebean
" " " similar from Shebean shaft
" " " 12' down see p.35. Slate from B.C.Co. shaft, Sept.4,1890
dark blue grey bituminous and pyritic
Fossil stem (diagram) from Sebewaing , pith filled with carbonates pyrite, zinc, blende ? gypsum? (Later note: calamites)
Fine grained dolomite ? 2 in. square. Is it a lithographic stone
Sample well #3 12' 9"

Drill core May 31. This specimen was taken 9.8 ft from bottom of the hole, i.e. hole #1, 1884 . A very fine grained light grey shale with laminae across core. Cut one and a lump coated with yellow sulphate fine and showing white filious needles.

Another core marked 1.41' a fine grained sandstone with some white mica, a light brown.

Sample of a fine grained brown limestone.

Specimen 9' 2" from bottom of shale.

Also specimen similar. This specimen was taken at the bottom of the hole 100' from surface, very soft, quaker grey. Slightly chalcareous, cemented, effervescent narrow streak of pyritic sand 1/10 in.
All these specimens show no fossils and are more or less striated lighter and darker.

Sample of sand from Bancroft well. A sandstone, coarse grains 1 and 2 in. May 5,94 130-138 from water bearing strata.

Balance of page 46 profile of compass line from Sebewaing to Stone sand on Sec.5 - 16 - 10 . Continued on and thro page 55

p.57 May 30, 1896. Running E. from Bad Axe to Verona Mills.
1895 Bad Axe R.R. Station at 8:45 A.M. Beginning of rise, boulders numerous.
1920 Rolling. down a little N & S road W. line of Sec.21
1925 Gentle rise last ¼ of a mile
1942 Rise. Terrace like. Air Tem. 66°, steadily rolling rise, irregular topography.
1948 Crest of valley line of marked hills bordering it on E. One cut between this and stream viz., runs N. & S.
1934 Cut in boulder clay. Hill does not extend

1911 Ridge about 4' above water and 6' above bottom. The valley is about 15 miles broad each way and flat, marshy, the stream winding in it.
End of valley. N & S. road center of Sec. 23
1945 Top of a discontinuous bench visible in a series of spurs from the ridge E.
1980 Cut into hill. The lower part of the hill shows boulder clay, the upper part contorted winding laminations of sand and clay (due to wind ?). The country irregularly rolling and cut up ahead.
1998 Hill immediately to N. rolling surface. A number of points equally high but none much higher. 9:30 Country south is as high, also a hill N. 40°E. This ridge runs out (?) > 1 mile farther N. In the drift, a great variety of pebbles, hornblendic rocks, quartzites, granites, pink and white, much white - jasper, black calc shales with trilobites, reddish green sandstones etc.
1985
1905 Stream again
1931
1955
1955
1920 N & S road quite flat W. line of Sec.22
1915 little drain W line of Sec.21
1910 N & S road , a little rise W. flat N & S.
1908 Other side of rise which is now S. of us flat and close to Bad Axe. Could have been no great fluctuation in B.

June 1, 1896

1578 B. at Bad Axe at 6:45 A.M. From Bad Axe to Elkton along the Pinnebog flows in a distinct trench and that is only 4 ft. deep.
Just W. of Elkton another.
1382 B. Bayport is 10' above water at 8:00
1392 Level of hotel on Cedar St. Bayport
1403 Top of sand ridge fairly level probably, dune sands, jack pine and oak.
On Main St., center line of 36.
1380 End of marsh. Rise in road, the sand dune belt has followed about 250' N.
1395 Flat top School house # 23. N & S. road. dunes about 300' N. Section line 31/36. Well 15' deep, all in solid clay. (Roadways may be taken as clayey when not otherwise specified today). (S Ma Fuller) runs from nearly dry to full. Now about 6' from bottom.
1390 The same applies on road between Sec. 31/32 Caseville.
1398 5 wells on the place W.L. Webber. This location is nearest to one 61' deep with 5' sandstone at bottom, limestone at top. Water 20' from top of ground.
1400 Limestone outcrops on knoll in rock
1393 Corner . turn E.
1410 All along the road S. line of 32, limestone slabs gutter lined with lithostrotion proliferum as in quarry samples.
1410 Well, good well.
1398 We came back to this point. We turn S to quarry, no road N. but a road on E which we take on leaving quarry. The country slopes to N.E. The apparent strike of quarry was Southwesterly but it is nearly flat and it seems to arch a little. The lithostrotion is very thick, about 2½' from top, exposed at N. end of quarry and according to Mrs. Smith are most abundant there.

There are large balls which appear to be silicified sponges below. Auło-pora and L. mammilare forms associated. At S. end of quarry Allorisma and Productus forms in nodules on geode bed just under the chief horizon of lithostrotion. The lower, blacker limestone beds seem to be rarely fossiliferous. I wheeled S. to office and then back and also took photograph of glaciated surface striae from N.E. 10°

1408 Back to S. line of Sec. 32 Caseville and on E..10'well, no rock. 4' sand, the rest clay. The water poor. Road N. none S.
1395 Creek to N. Wind Creek about 3' below road.
1390 Well 15' deep, no rock (?) clay. All the year round, water.
1398 18' not in rock. Dry last July. 100' S. of road. 10' deep. Runs dry. N
1398 Swamp about 30' broad culvert.
1400 10' deep dry quite often muck in gravel and hardpan. At the 14' barely dry in hot summers. 3 more houses 14' drilled and 18-20'. All went dry last summer. 2 miles S. of here 80' deep all rock.
1410 Over road that does not go N. Turn S. now. 413 ~~FairHaven~~ winsor 7 P. Well 200' to E. R. D. MacCauly. said to be 80' deep, drilled well. Water 70° Oct. 30.
1395 They got to rock about 40'. all clay. Dug by Hofmeister
20 deg. 15' drilled. Water about 7' below surface.
About noon. 20 deg. 15' drilled. Never dry in last 3 or 4 years. He drilled to 40' and it filled up. There is gravel at bottom. Nearby a little N. a well 60' deep where the water nearly rose to top.
1400 R.R. Close to R.R. it is 44' to the rock which is limestone like the quarries.
1405 An E and W. road between 3/10
1385 198 ft. mostly soapstone.
180 water rises 1 ft above ground. Salty 48° F. Dug by Hofmeister.
1390 Well 190'. About 30' to rock, soapstone, limestone, sandstone. Waters in sandstone comes to about 7' of surface. A 20' dug well goes dry. Deep well drilled by Hofmeister 48°F. Henry House to E. another deep well. Einers, said to be the same 240' ? Dan Bullock.
1398 John Dietzels 80. 500 steps - ¼ mile N. of S.E. cor. of Sec.9. 180' deep, only 2' to limestone which is 6" to 2' deep all over. His 40 runs across an 80 and the next W. Li drops about 18 ft.

Diagram

Also 180 acre lot E. About 40 rods N. it goes down 18'. About 30 rds S. it is down 6'. Dietzel struck it. It goes off more gently south. Near 80 rod line W. it is darker solid, i.e. line between Dietzel and Challis. cf P.36 Challis.
1390 Road being E & W. 9-10/16-15
1400 555' S. of road all around house is limestone with lithostrotion, bare ledges at surface for 6 to 8 acres at one place.
(79 X 11' - 55 plus 24 x 11) from the road the stone has been excavated for 3', much lithostrotion proliferum. the country and the ledges appear flat. At this place there is a well perhaps 155' deep.

Well 12 ft. Not often dry. We
Well quite deep driven T. 48°. 30' to rock.
1395 Well 100' deep, 50' to rock. Bore for 2 years by Reidel & Hofmeister.
1395 Pigeon bridge, water about 10' below bridge. The bottom 2' lower. Banks of valley 4' above stream. wider valley about 300' wide.

Diagram

1398 Summit of 8' knoll which is about level of county but above valley of Pigeon.
1405 N & S road N.E. of cor. of 15, flat both ways except about 200' S, valley and bridge not > 10' lower along E. end of 15
1390 Well 15' or so. dry in summer
1388 Bridge. Stream 8' lower, bottom 2' lower still.
1398 Well 12' deep, not dry
" not deep , other side of road
1401 " 12' deep, 20' bored. always has water.
1405 Well 110' deep, drilled last summer, about 75' to rock, T.47°
1406 165' from road 2 wells No.1, 20' deep, dry in summer
No.2, 200' deep, 80' to rock, sandstone
Well 12' deep, not often dry.
E & W road S. line of 15 and 16
1410 210' to 220' too bitter for cooking, W. of road
1398 Well 30' deep, never dry.
1400 E. road, shallow well along center line of Sec.23. Here I stopped to inquire.
1410 R.R. P.O. & Port Austin
1400 N & S road, the E. road we are on becomes mere trail.
Road E & W. S. line of 23 and 24.
Gravel ridge
Road E. S. line of 25
Ridge
State road. S. line of 36
E on State road, all through
1415 Culverts. nearly flat.
1410 Pigeon 8' below, 2' deep
Sandy all along here.
Sand 4', under clay. 60' down to rock.
1455 Road N & S. 33/34
Stream 5' sandy rise ahead to
1470
1480 N & S road, good 34/35
Stream
N & S. road 35/36
1500 Foot of marked rise
1522 5:40 P.M. Top of marked gravelly rise, runs N.N.E. and S.
1525 Top, hilly and rolling
1520 State road turns N
1495 Bridge 10' above stream to N.
1530 Top of - ? 30' , gravelly
1530 Bad Axe cemetery road

June 2, 1896 Caught cold yesterday. Made enquiries as to Bad Axe water supply. Water works locations on Atlas. Depth 200', T. 49°. Water began at 79' and did rise to 11' from ground. Now they have to raise 15' Rock struck at 40' to 45' .

Near Sec.19-17-12. Rock near surface at Soule town - bed, and just E. lands of Michigan Cement Co. also Sec.7, Colfax Township.

Wells in Bad Axe.

A. 3 Waterworks wells about 250' S., 870' E. of W. ¼ post of Sec. 24, S. end of Houselman St, below Main St.
B Artesian well on Sec. line 18/19 about 75' S. of ¼ post.
C Irvin home, about 100' N and E of W. ¼ post of Sec. 24. 14' well, never dry.
D 90' well. 40' to rock of S. Burgess lot 17 John St. 1900' W. 1000' N of W. ¼ post, Sec. 24-16-12
Jail
Whiton ? Ho(tel) or House
Morrow
Post and Seeley Bank
Hubbards Bank
Skinner
Block 11
Schoolhouse block 8
R.R. Station
Thompson
Wrights farm 80' well in rock , just E. of line, N of State road.
New Cemetery
Locke's(or Hocke's.)

A few notes around Bad Axe, June 2, 1896

1500 Bar in front of our house lot 6, Block 18
1505 " " Morrow W
1505 at 6:30 P M, Cyclometer 44.75
1492 N. line of 1 E-W road, culvert and dike
Center of1Road
1505 N. line of 12 - E-W road, school
1520 N. line of 13 Crest of the rise only a few feet back
1500 E W(?) of Pinnebog, bridge over stream,about 5' lower
1496 N. line of 24 R.R. crossing S.T. & H.
1520 Top of rise, land 3' higher, i.e. near Irwin St.
1517 Main St.
1530 A few moments after

June 3, 1896 Wednesday

1531 Bad Axe town level B. at 7 A.M.
1519 Station level
1527 Port Crescent Ave. 1486 of June 2, p.73 (should be 1496)
There is a ridge of land to S of the R.R. of which Webbers gravel pit is a spur.

Pigeon notes

Well on Henry Moeller's place, Pigeon, Near S. line at Harder's place 3½ E. L. M(s) is a well 22' deep about 1' down to rock. Around that it is 22' to 26' wells down to rock. MacLeans well at Pigeon is 150' deep, about 40' to rock.
Planing Mill.
Elevator Store, samples just thrown away.

Steam Stave mill.
Allington (Arlington) House 50' well, hand drill, water to within 5' of surface about 100' W of N.¼ post of 11. Another steam drill well 1 rod off. 109' .
1394 Pigeon at S to Southline of Sec. 2-16-10
To new Well on Millers place (Henry Moeller) a little N of S. line of Sec.2 In Pigeon
Fisher, the blacksmith's well is 98', good and plenty water.
Kleinschmid (or Kleinschind) the postmaster's well at the house next the P.O. depth 163 ft.
Dr Frendels. Well is 115' deep
Likens stave mill. Well is 285' deep but they went to see what there was. They got into red stuff and salt at 160' fresh water.
Planing mill well 150'.
Cheese factory 149'
Other wells. Hartly Elevator Co. to rock 45-50'
The well of Moeller is so far as down mainly clay
½ mile E and 80 rods from this road, i.e. 1900 W. 450 N. in Sec 2-16-10 is a well 39-40' deep not in the rock. Water comes up only 6(inches ?)
About 1½ miles W.(See run on p.63) it is 100 ft right through rock to water.
Swain's well was 120' rock right from the start.
Anklam across road 46' (this seems to be Zwizer and Aublam in Sec.10 and 15, 16-10)
This farm the well is 29 ft and 2ft rock, the water right on top of rock then have to go start.
In a place 2 miles N. the ground was hard, dug 8 ft then drilled 20' (cement rock,) dissolved like soapstone, blue and soft, the blue soapstone on top of the water bearing stone, then plenty of water rising to top of well.
Off 1 mile N.E., i.e. along road between 1 and 2 are a lot of wells 29-40' wells flowing into ?
The surface water is hard and the water generally is hard, but occasionally as once in the streak of wells ½ mile E. we get soft water below.
On Muellers (Ferdinand Mueller) E½, S.W.¼ Sec. 3-16-10) the rock (gypsum) is said to be but 9' deep. Information above is mainly by Kleinschmid.
The man who is drilling says" the rock is mainly slate and sandrock. 3 miles S of Kilmanagh is 10' slate.(Samples of this well received later).
E and N of here changeable. There is limestone through 3 or 4 miles E of here but cement.

N and E of here is gypsum at the place of Gershom Wilson Smith ? 1½ miles S of Soule in Chandler Township (cf. William Smith)
On the S.E. of the S.E. of Sec. 25, Chandler
Cement is said to occur in Mead and Chandler Townships. The plaster is on top of cement. In Elkton there is 18-28' of white rock.

On in Winsor Township flat country and generally clay roads.

1408 R.R. at S.E. cor of Sec. 2, about 7' above county
1412 Well 23' dug 22'. 14' of water just on rock which is not so very hard. This house is close to Pigeon which is at bridged about 6' above water. Bluffs on the E. side, gentle on W. Stream about 2' below flood plain.
1415 Level of general county plain. again 22' well good.
1425 R.R. track again

Ferdinand Mueller, an old miner and old settler says that at 32' is a big layer which according to samples is white gypsum IV, running E and W. On the other side of the stream another well at 32' struck some layer say 2' deep. He was a miner in Germany and says some of the samples were "pracht voll"
Well 8 to 9 ft from bottom. The water rises in well. The water comes from the west. He says in an adjacent drilled well was 4 or 5 ft of gypsum.

1415 Back to R.R. track.
I am told that right where we strike main road again was a 60 ft well all hardpan on the road.

1420 Back to N.S. road and R.R. track
Henry Moeller's place about ¼ mile N. has some fine lithostrotion mammilare a canadense from Webbers quarry. Also an atrypa reticularis which his son gave him and said he dug out of cement rock.

1415 20' deep in hard clay. 8 to 9 ft. deep. The water in N.W. of Sec.35, Caseville 17-10 R.R. and E.W. road at S.E. cor of Sec.3, again
No deep well . Flat clay road and soil
(1) deep well. 163 ft. put down by Reidel, hard water.
(2) Shallow well rarely dry not so hard, but rain water preferred for washing.
Flat clay rod well . 63Ft to rock. at 130 sandstone. 163 ft deep, hard.
Schultz house. 140 ft. well, flat clay road. Air Temp. 75°

1445 E and W. road joining the route of p.67 -25-34. S.E. cor of Sec.10, all flat clay, boulders rare.

1445 E and W. SE cor of 15 flat clay.

1440 14' clay , 19' gravel. Well not down to rock, new well moderately hard.
Close to Pigeon R. On the N and S road, just left are said to be 3 wells over 200 ft. deep.

1445 Small bridge over small stream valley (west branch of Pigeon) about 8' below county level. Stream 3' lower and 1' deep. Gentle rise to W. up again.
Handdrilled well 42 ft
" " " 28 ft.
" " " 48 ft. On top of limestone ¼ mile S. ½ mile E. only 4 ft to rock. All day to it (is this in middle of S.22)
N & S road. E & W. keeps on line S at S.E. corner of Sec. 16. Soil gravelly.

1478 56' well

1480 27' to rock to mixed up stuff. The country really flat as a pancake except a little stream close to road. The well is oily in stormy weather. He dug 20' drove 20'. (on the east side.

1480 27 ft. Bridge is 5' above stream, 3' below country level, shallow, ill marked valley, the stream artificially cleared out.
20' deep
27' deep on E. side of road. on the 40 N.E. the rock is 4 to 5' only from surface. August Blunde(i.e. Blundy on May, N.W. of SE of 22).
E & W. road on S. side of 22

1472 2 wells , 1 dug 12 ft then drilled to gravel at 38' . the other 41' to rock then soapstone. Then at 300' from road a well 60' to ? rock
100' from road and 11' to E, big ditch, SW branch of Pigeon.
E & W. road S. of 27 and 28.
N. of road. Rock at 68'
Soaprock and sandstone - Lucht
Well now going down by Chas. Hofmeister been going thro clayey sand and gravel. Just struck rock this forenoon. Max Streter is one of the workmen. His neighbor to S. went 96' to rock, 175' for water. (i.e. Einrichter)
This is the above well (Above item referred to : Rock at 104',depth 175 Einwochter).

This well belongs to Engelhardt Stueck. Chas. Hofmeister promises samples.

1492 N & S road turn S
flat clay country
bridge over stream to N and forking (?) in a very shallow 3-4' trench up grade.
Shallow well gravelly road here, 4 ft deep?
E of road 120' to rock, 165' deep. Jas. Hunton
Next neighbor S. on E. side of road, 135' to rock. Wm. Hunton or Hinton.
State line road SE cor. of 33-16-10. This road goes no farther S. but the big ditch which runs alongside it does.
1500 New well just finished on S. side of road. 135 ' to rock. 235' to bottom. The drillings seem to be mainly a blue clay.
1525 R.R. Winsor Sta. about 4 ft above country level. 73' to rock, 101'.
All blue clay to 71' Sample V
71-72 red clay
71-107 rock gray
At Stave mill 225 ft about 40' red at bottom

At Bergmans place 1½ miles W, 3½ miles N.(i.e. Henry Bergman), S. of N.W. of Sec. 15, the rock is at or near surface.(on N of N.E. of 16)
Also Einer's(? is this SW of SE of 4-6-10)
1515 Leave State road and go on N. road clayey from R.R. on (cf p.69 3045-2945)
1515 Well only 16' deep . country flat, stream N and E in woods
Turn E. (p.69 2945)
Houses along here have only shallow wells
Into valley of Pigeon.
Bridge 4' higher > interval , about 6' > water 2' deep, sandy, bridge is about country level.
N of road 14' well.
N & S road E town line of Winsor
No higher land around
Barnhart not far off.
Jo Gassinke about 100'(no good) and 54' to rock which is sandstone.
Well about 300'n. Lots of slate in rock.
Clear white sandstone is rock with water 178' deep, 7-8' sandstone, blue sand before, white sand with 6' lead. E. of here 1½ miles and thence N. flowing wells at 100-20'
Road S. at N¼ post of Sec. 31
Road gets rather sandy
S of road 13' well, 4' gravelly sand, rest clay. Has about 6' of water all summer
N of road dug well about 15' deep
N of road dug well about 16' deep. Sandy all along this last route. Turn down into lower valley.
1560 Bridge stream marked with terrace.
N & S wells down to rock and drilled in it. Not flowing.
1565 S of road 30 ft to rock
Flowing well; 127 ft to water with rust
47½° F. Temp. of water
a water pail 1 minute
on north side of road 32 ft deep.
1560 N. Elkton N and S. road
On E. side of Sec. 28
1565 30-35' to rock. 106' deep in grey sandrock.Some slate. 47½° F. Temp. flowing not very hard

Next place S. on this road also the next W (i.e. SE of 28 and SW of 27). The wells are 140-145' deep (and flowing). ½ mile E. and ½ N. another well at 110' (i.e. S. part of 22).
1555 Next two N. 110' deep. about same depth to rock etc. Only about 5' rise.
Road E. poor. on S line of 22-16-11
3rd place. 85' deep (flowing) about 30' to rock. 47½° F. temp. No harder > the 16' dug well.
W. well 91' deep. no strong flow.
E. side of road 20 or 30' deep.
Pump
W 104' deep. rock at 27'
W 104' deep 47½° F. a small flow
E & W road, S line of Sec 15 and 16
1553 W a shallow well
1550 W 140' deep, flowing. 25' to rock or according to another account 35-40' to blue soaprock.
E. flowing
I see force wells in Elkton village about Presbyterian Church etc.
1555 The R.R. S.T. and H. at Elkton
The flowing wells around Elkton are about 120 ft deep. They are robbing each other. Wells which used to flow do so no more.
George Smith
Cheese factory
R.R. station p.25 is 225 ft. deep.
There are 14 or 15 right in town.
John Grills. on or near Lot 8 of Elizabeth Taylors plat of Elkton.
Flows of water at
66'
80'
110' the regular flow
215' deep

Rock consisting of slate, black coal, white rock etc, through sandstone to red paint ? or 10'

This side the marsh W. of Elkton are flowing wells, across the well now Grills well flowed until they cut the packing of the R.R. well 4' below ground. When the main, (vein) (or possibly wind) was from the S.E. it flowed a 1 inch stream, when W. or N.W. it did not flow.

(Killmanch ?) I cannot find this name. Does it refer to Kilmanagh) 160' deep.

Well said to be going down near E cor of Sec.12, Hume Twp.
Near Port Austin by Simpson and Hubbard.
This is Chas. Wright's well.

June 4, 1896
Road S. past Fair grounds. From here on 4' lower black loam extends about
1685 1 mile N. and way S. with 6' sand flats around it, the road cuts showing very stony bedded gravel.
Turn N. to cemetery
1692 Top of ridge cemetery gate and apparently as high as anything near, the cemetery well is 10-12' deep. Top 4 gravel sand next of(to) the clay. clay at bottom.

C. A. Wright says the new County ditch is draining the well.
The well driller -----Rapsa says 4 miles E and 3 S. it is 130' to rock with 20' hardpan, 60' blue clay, then mainly quicksand and at 130-140' coarse sandstone.
Dick Harrison (SE ¼ Sec.3-16-13, Vet say see p/108-109)
Mostly sandstone around here, now and then soapstone. As we go N. toward Grindstone City, there is very little rock until the soapstone. Then 100-200 ft of soapstone with seams of sandstone

At Grindstone City 3 to 4 up to 20 ft, i.e. a few feet of coarse rock, then soapstone on down 200 ft or more.
7 miles W. of here on Straters farm(or Sopers) at Robert Browns, there is 60' surface most clay but 12-15' of quicksand on top of rock. Then 5-6' of sandrock. The water rises within 4' of surface at Sopers, within 15' at Browns.

There is one flowing well, a small flow at Port Austin at Omer Fillion (that is Homer Fillon, S of SW of 8-18-13, 4 miles S of Port Austin and 100 ft deep. The water came 2' above surface and was on a 10-15' hill.

There is a strip of country about two miles wide from Grindstone City to Sand Beach where the water is salty. The well section being about as follows 4-5' surface, then blue clay. At 40' rock and soapstone with a few feet 8-10 of sandstone and at 100 we got salt water.

At Verona rocks seem to be on a level and the depth to strike them is 40 to 100', according to the level of the top of the well.

Thre(with) conversation and back to Cemetery Road at 1:20 P.M. (Cemetery
1710Road is section line). State Road again. 2-3' cut. Land lower immediately S.
Low land
Beyond gravelly
S of road 8-9' dug well
N " 10-12' " "
1705 At county poorhouse 102' deep. 85 another says
1708 Road nearly 91'. It is 50 ft to rock which is ? soaprock. Information as to Winsor Twp given me by the Poorhouse manager, formerly master of roads for Winsor, Mr. Garger ? Geiger.
In Sec. 28 it is 45 to 60' to rock
" " 21-22 " 22 - 38 " "
" " 8-9 " 2 to 8 " " or on top.
" " 11 by Pigeon 40' " "
" " 14 & 22 35 to 44' " "
S part of 6 60 " 65' " "
With water at 105 to 216'
In 29 & 30 it is 60' " "
In the NE ¼ it is 8 to 22' with flowing wells at 45'.

Around Sebewaing it is 45 to 90 ft to rock.
Coal on the average at 90'.
1710 N & S. road E. line of 22 turn S. road good both ways, cuts in sand and gravel immediately to S. ceases in 200' and we come into flat country plain, there is a sandy rise 3 ft. or so to the W.

E of road dug well water 8' from top, 4' ditch to road W.
E " " 8-10' deep in hard clayey gravel, not stoned up, stands well.
W. 7' clay, blue, hard to dig
6" gravel
4 blue clay
more gravel.
End of mucky plain.(Of what Dr. Henderson says about (1) muck, above (2) shell marl above (3) muck above (4) shell marl.
1703 Top of gravel ridge
1710 Cor. 1½ mile S. of Bad Axe. E & W. road, a sudden drop of 4'. 50' S, road very sandy , E & W.
Up to here very sandy, dune sand, then down and harder.
Line of a 40, S of here 1/ 40 is a 6' well. Here are two houses with shallow wells.
1715 Road very poor beyond dug well. One can walk through to State Road (on Town line) but not take a team.
1718 Back to 1710 just above. last.12 mile sandy
Along E line of 34. All sides of 16 now open 34-16-12
1712 (Really 4' lower than 1718 just above. End of sand.
1705 Stream 6 in. deep 4 ft below bridge. There is no perceptible valley from here. Beyond flat.
E dug well
1715 " " 18' deep, 10' to water through a bluish gravelly clay with much white chert etc.
1718 Well 13' thro clay, bottom said to drop out, quicksand or gravel.Lots of water.
1710 Road W. in a low corner in all directions as far as we can see flat draining to S
3' rise from corner on to clay, one of the houses here is the 18' well like the 13' above.
Well struck water at 20', 200' back.

N & S and E & W roads at SE cor of 33-16-12. An 18' well through gravelly clay into coarse gravel, hard water, farms settle right up. Deans or Deanis Well about 16 ft. ¾ mile ahead (to W) 17' well. Around Tyre rock is on the ground. to the W. the drain is 3' to the mile, to the E only 1½ in.
a 200 ft broad 2' high clay ridge, all roads back of here hard and clayey.
16 ft well, plenty of water.
flowing wells in Brookville(Brookfield, agreeing with what is said ofOwendale.
E & W road lonesome. E. S. line of 3-15-12
1718 Well 24' deep through gravelly clay
1720 " 27 " on sandy ridge 200' broad.
1718 Road W a mere trail, no houses, no road E.
S line of 9-15-12
1708 E & W. road S line of 3-15-12
1708 Ditch
1710 E & W. S line of 33-16-12
1700 Stream to W. 3' below road, ditched out in a shallow valley, Pinnebog
1700 E & W road S line of 27
1704. This is really higher, it is the State road, clean yellow gravel, just S, whereas the general rule had been previously a white gravelly clay.
(Altitudes on p.110)

June 5, 1896
Record of the Bad Axe flowing well near here. E ¼ post of 99-16-13
Position and appearance described on p 103, and it is said to have the main flow of water at about 200'

		Orig.Fig
		20 clay
		5 gravel
45		5 hardpan
50	80	30 sandrock
80	85	5 white shale
85	115	30 sandrock
115	123	8 limerock
123	153	30 sandrock
153	163	10 limerock
163	190	27 white shale
190	215	25 sandrock
215	220	5 limerock
220	230	10 white shale
230	250	20 sand and lime
250	275	25 blue shale
275	295	20 white shale
295	300	5 red sand
300	307	7 black lime
307	312	5 sandrock
312	317	5 black lime
317	320	3 gravel and sandrock
320	335	15 blue shale
335	340	5 lime rock
340	350	10 sandy shale
350	360	10 lime rock
360	400	40 white shale

Size of hole 5-5/8 in. John Sullivan. Depth of hole 400'

Irwin(Irvin) House
1680 R.R. track
Road S of E. Sec. of 19-16-13

1680 The well whose record is given above(and appears a little lower R R track) delivers a strong stream 3' above ground. It seems to be at lowest point of ground and near distinct hill 8¢ a second; 47° F. Slightly chalybeate.
hard flow of water 175-200'
Back to E-W road, center line of 20-16-13
Gentle rise begins culminating farther on. Numerous large boulders scattered over surface to the SW in a belt 300 to 400 ' broad.
1690 Up to here rolling rising gravelly. The well is probably not to rock.
Characteristic in the gravel is much red or green fine grained slabby sandstone.
1695 Summit of ridge. Well 16' deep which went dry last summer.
1680 N & S road down in flat. E. line of Sec. 2
1675 On a muck sand and gravel knoll, about 4' above marsh is a 16' well,never dry.
All the wells are shallow around here.
1695 A 10' well with 5-6' of water.

1695 Around Port Austin the drilled wells are 60-100' deep, occasionally flowing, the rock is met close to the surface. Toward Ubly it is hilly and 100' deep on hills, fading out to S.
1705 N & S. road goes N fading S, E. line of 21. Fruit house beyond on S side is Thomas Rapson, said p.106 to have a drilled well. 3 and 4 ft rolls in the roads.
1710 Crest of road rolling flat ahead, white gravelly clay.
1718 Crest very rolling country. a 22 to 23' well. Diagrams
Road turns S over hill, no higher E until other side of Willow Creek.
1722 Top
Bottom is 3 ft. lower than top of culvert.

The Bad Axe Waterworks wells have brought up in pump, a piece of rounded oak, like beechwood and of box etc. Much vegetable matter found (or forms) in the pipes and I promise to take sample to Kedzie.

1728 Top bouldery clay. Mountain (?) effect of rounded hills with a common upper level but undrained hollows.
Down 15 ft.
1728 Up again
1718 Down 5 ft and up to a 10042, a 15ft hollow ahead,
Really as high as 1728(next above). To the W. a deserted plateau at this height.
1718 Slight sandy rise in road. 15' lower down than 1718 (just above.
1700 Dry drain.(This house has to come way down hill for water.)
1695 Numerous Cambrian boulders
Top Rapson on Main road has drilled well.
Mr. Balmer 1st on left side after leaving schoolhouse(SW of SW of 15-16-13)
1688 All flat and wooded from here , E & N. About 8 above Bad Axe
1688 End of this alluvial plain; road bends E and climbs hill. The E & W. road is just being laid out.
1708 A house S. on the hills about 300' away, 2 or three wells about 10 ft. deep. One below the house used to be a spring but not now. Last summer all went dry. The north side of the road is very bouldery.
Turns S and rises steeply over hill, boulders of fine grained conglomerate and sandstone very plainly in drift and less rounded than the crystalline hardheads.
1768 Faint indication of a bench
1766 Crest(point of a faint terrace)
1760 Top of hill undrained hollows with water in them, close by road, many large 2 to 3 ft. boulders.
1768 Beginning of steep descent, a dug well about 27 ft, deep, never dry.(This elevation (three preceding and this one inc) is apparently about on a level with 2/3 up of Bad Axe standpipe, i.e. 60 plus ft above its base, which agrees with bar.
Lowland muck gradually rising to
1720 sandy land, the bottom of rolling land rising (or being) at (There is a
1710 deserted house said to have drilled 47 ft to the rock, Wm. G. Bradin's.
105 ft at Reed's.Then on the rise a white gravelly clay, much dirt.(or chert).
1745 Top of road about 6ft down gradually to
E & W. very hilly road. Township line S. of 34-16-13.
1738 Stream cor.S. 13 m.
1760 Crest of little rise.
1762 Good cold water. probably a drilled well but the house deserted. Is this Reed's.(But there are Reeds at S.E. corner of 15 and 22) easy pumping.
1795 General level again

1805 Ups and downs in road to this higher level yet.
1810 Well 141 ft deep, 6 ft in rock. Water rises 81 ft and is pumped 60 ft by a force pump.
1812 Top of hill, narrow valley, ¼ mile E. broad flat to SE
1780 Well down hill from road
1775 B at well. Depth 91 ft of which 5' sandstone. The water rises to 30 ft of surface.
E & W road. S. side of 3-15-13
House at corner has about 25 ft dug well. Of the two houses next S. the one to E. cor of E has not well.
The one to W a driven well.
1805 On S. side(F.Warren) well 112 ft deep, rock at 106 ft. water comes to 65 ft from top.
The road keeps a rolling level with undrained hollows, then descending.
Beyond here no questions asked.
1775 Slough drains N.
1810
N & S road hilly but fair, E side of 34-15-13
1770 Undrained hollow
1763 Small drain to N. boulder clay. Hills on E side of it 15' high.
1730 Flat most of the way to here.
N & S road houses skipped on the last mile. A shallow drain from SW to NE right at the corner. SE cor of 6/5
1740 Wadsworth
Schoolhouse. Wm. Belden, Director. Has well 85-105 ft. deep. Most wells around here, the school teacher says, are 115 ft deep.
1725 Good road ahead, turns N (on E. line of Sec.6)
Turn in, E & W road , from E runs N.
1720 F & P M R R .
1720 E. end of Road running W, which is flat and clayey with an occasional slight gravelly rise.
Slight steady rise to the Irvin House.
Road E , all the way, flat, no houses of importance.
1750 Road W. S line of 24.
1755 Irvin House. E¼ post of 24.

June 6, 1896 Saturday. Drive with team.

1742 88°F. House in Bad Axe, cor. Bacon St and Sand Beach Av.
1742 N & S road, W line of 22
1745 On State road close to bend S
1750 Terrace, level N. of Popple, near John Long's place.
1740 Popple bridge (stream 10' lower)
1758 Popple
1788 1 mile S. of Popple
1775 E nearly a mile N & S road. A drain to N about 3' below road. The main roads mainly gravelly clay (and the country flat).
1775 Another mile, country all flat gravelly clay, N & S road
This road has been gone over.
1773 1 mile N. SE cor of 33-16-12
1775 Bridge 2 miles N. Stream 5' below. Close to SE cor of 28-;6-12.
1795 1 mile N on State road SE cor of Sec. 21
1790 Bad Axe State Road.

Sunday June 7. Two Thunder showers.
Monday " 8. Morning rainy wrote up notes and developed plates.

June 8,1896

2115 At room in house and the little barometer seemed to be station(ary).
2100 Irvin House cor, i.e. E ¼ post of 24
2080 Crest road
2075 R.R. must be 10 ft lower than at 2080
(1-1/4 (might be)
Warrens brickyard) is(114 M. N of track on W side of road. Of this brick are (?) built the Wadsworth schoolhouse, Bad Axe jail, schoolhouse and banks and private houses, Elvan Schoolhouse, and it has been shipped to Port Austin Sandbeach, and Gagetown. The color varies from cream to red, the sandy clay under the clay mainly used making a whiter brick. The red are the outside of the kiln. The white are inside. Toward the top they become chalky, the top one or two layers of each burning being spoiled with mineral water. Of the refuse brick the better are used for scouring the next burning. The yard has been at work some 13 years in 1895. 300,000 brick gross burnt average, 250,000 a year burnt. The limestone pebbles are not so much trouble as the mineral water. About ¼ mile back from the brickyard W it is very bouldery with Canadian hardheads, one or two as much as 6 ft long.

2088 On the N side of Warrens property a ditch running WNW. Stream 4' lower than reading(?) and 124 x 11 ft from the road.
2110 Irvin House at 2:30

Tues. June 9, 1896

2025 Bar. at the house.
1995 R.R. N E. cor of 24
2000 Opposite the clay pits of Warrens Brickyard
E about 85' deep, about 40' to rock
W 15-16 ft deep (AT H. Wilcox)
The R.R. station the well shows 40' solid clay. The clay is not as deep on hills as in lowlands.
2017 Crest of gentle rise near E & W road . Roads fall off N & S & W, level E-N line of 13.
E. Only 10 to 12' . There are deep wells West.
2003 Shallow , 10-12 ft.
Well at Truax ½ mile N. of schoolhouse on 6-16-13.
E & W road. N. line of 12, rise to E, but very flat.
E - E road on center of 6-16-13.
L. Truax. 63 ft deep, on this W. side of the R.R. plenty of water, did not lack much of coming to the top, fed 30 head of cattle. 100' N of E road and 101 x 11 ft from cor at W ¼ of Sec. 6.
1995 E & W road, N line of 6-16-13 300 ft N and E of the corner, well 60' plus in SS and 40' plus in rock, water rises to 7' from ground.
2015 On sandy knoll close to R R track. sandy 300' back and ahead.

I found Wm J Rapson, well driller, has brother, Anthony, uncle and father in the business. I left with him 1½ doz. bottles. He gives information. Chas. Wright of Sec. 12 . Hume is 340. Sat. night, June 7, Hearns(i.e Eadward Ahearn) ½ mile W. is 118 ft. ½ mile S and 1½ mile E 103 ft.(This is Homer Fillion), deep, only about 1 ft heard (?)
½ mile W. of Fillion 130 ft and no flow, the water being 19 ft from the ground.
2012 Summit of gravel ridge.
2000 Road N. poor E. None S.

2005 Miller. Like sample. Old well 13' deep with 20 inches water. The new well does not rise 20 in. high. The new well is 66 ft deep.

June 9, 1891

The water is 13 ft from top of pipe say 17½ ft from ground. The old well dry last summer. The new well is somewhat mineral but not so hard as the surface.
Flat muck swamp, 4' lower than Millers.
On gravel rise ahead.
2000 Crest of ridge , tho a 5 ft ditch thro it lets water N.
E & W. road high about .20 mile E. connecting with the ridge just left.
Shallow 9' well
Back to cor, round a bendm too muddy, then W. on N line of 31
Wells around here about 16 ft, dug wells.
The water flows W strongly in ditch.
1990 R R 2' above general level(but a crest a little way N) at 12' a kind of spring never dry, last summer used for thrashing all around about 200' N of road.
No neighbors around have drilled deep.
1985 State road, N.S., E & W. N from SE cor of 25-17-12
Drainage of ditches as per sketch.
1955 E & W road, stream from E.
1958 Sandy knoll cut thro by ditch so that the drainage is still north.
1950 Fillon cor. The Churchs are said to live 1 mile S and 2 miles E and are well drillers.
Desire Fillion , SE of Sw of 18-17-13 is said to have drilled a well.
1950 Yellow sand pit, to south flat.
Up to here I made inquiries and there were said to be no drilled wells along the road.
1942 Well dug 13 ft, bored 7 ft in clay and quicksand.
The Rapsons are expected to drill next week.
1942 E & W road S of Sec.7
1940 " " " road sandy, no drilled wells Sec.6, S of 6-17-13.
1925 E & W road. Opposite Kinde

It came on (or commenced) to rain and I made tracks for Chas. Wrights place which is W of SW of 12-18-12. (There are said to be no driven wells along the road except about 1 mile S of Wrights in Sec. 13, one (170 or 117')
At Wrights the well was 350' deep. June 9 at noon it was 25' to rock.
First a hard flint rock few feet sort of a crust
Then a few feet of grindstone with no crust over it.
Under the sandstone the shale was quite black for about 20'
At 350 they appear to be in blue shale.
Church Bros. present address, Port Crescent. Permanent address, Filion drillers. They have drilled around Caseville down to about 274 ft and generally fine gypsum. Also S & E from Caseville, the gypsum is on top. The surface is generally shale, the gypsum generally under shale and above the sandstone. At McCurdys it was grindstone, at Langhams they met grey ptus plis ?.
1835 Crest of terrace in SW ¼ of S c. 6
1820 Back of Port Austin terrace at 1
1770 Port Austin R.R. at 2:30
1945 Bad Axe R.R.

Book No. 114 L.L.H. T 53,54,55, R. 33,34,35, Sec. 31,6,7.1,14,15,36,12
Barometric readings ,elevations and diagrams of outcrops in this area, Portage Lake, Quincy R.R. and buildings of the mine

Book No 115. A. C. Lane 1895. Devoted entirely to description of outcrops in Isle Royale, with bar. readings and diagrams. This is copied from an earlier numbered book.

On page 72 under date of Sept. 25th I found this reference to fauna:

On this trip Forbes found a caribou horn 7½ ft long and Summner killed the same day a snake, brown and black. On the island no chipmunks nor porcupines, but there are snake, rabbits, Canada grouse, weasel and red squirrels.

Book No.116 T.55, R. 33, Sec 31,29,28.
pp 1-36 Bar. readings and elevations of locations in the above towns by K. T. Mason
pp 37, (balance of book empty except calculations on back fly leaf)
May 14, 1897 Bar. readings and Alt. by L.L. Hubbard and M. L. Fuller.

Book 117. T 58,57,56,44, R, 29,30,32,32, Sec. 28,29, 34,5,8,7,18,19,11,15,16,14, 28,29,31,32,29,28,20.
Entire book made up of bar. readings and locations, more locations of corner posts etc. of the localities around Doller Bay, Allouez Canal , Gratiot River.
P. 120, Expense account.

Book No. 118. Had been copied from the original on to loose sheets which are in the original book. Covers traverses made on T. 57,58,56,57,55, R. 31,32,33, 34,38,39 and practically all sections Also T 56,54,50.
Copy made by F. S Shewell
Locations around Praysville, Concord, Ahmeek, Allouez R.R. and Creek, Douglass Houghton Falls, Lake Linden, Hungarian Falls, Calumet, and Huron location.
pp 110-118 list of specimens.

Book No 119. By C. F Moore, T 57,56, R 32, Sec. 8,21,28,29,31,32,14,6,5,8,
Locations and distances with a few diagrams.

Book No. 124 A. C. Lane June 12, 1896
P.1 List of well drillers in the Thumb Dist.
pp 2-4 Irvin House , Elkton and Vicinity, Alt. with diagrams.
p 4. June 16, 1896 Bullock is boring on Tom Snell's 80. E & W. road, higher at Shebeon bridge. Shebeon flowing over rock which is of rounded quartz grains with much white calcareous cement. Fenestella, lithostrotion and other fossils, very fragile owing to the sandy matrix, Phyconella athyris, Zephrentis, etc. Pigeon Rock at 48 ft, 1 ft blue soapstone, 98-102 ft water bearing rock.

I found Mr. Bullock close to the wire fence just S of road (about 7' down in a boring) about 300' E from wire fence, the end of Mr. Webbers wooded tract. In this tract are two quarry holes one S, the other more deep, the material showing fossils and apparently that a darker limestone underlies the calcareous sandrock which forms the surface rock here. From him I obtained information as to wells as given.
p 7-8 List of wells and brief descriptions.
p 8 has the following one; Jim Adams, Caseville
20 ft to rock
93 salty water
96 gas
112 thro salt
another casing
178 fresh water

pp 10-12 Further description and locations of well.
p 12 First item. Along S line of 14, top of dune belt which begins near 250 end of dune belt. Well 8' deep. The man here says that they were drilling for lead and got it.
p 13 The Hotel Hanna well is 304' deep, was finished last December, put down by Hofmeister, flowed at first but has ceased flowing.
Sebewaing coal shows all the varieties of iron sulphate and weathers very white, fossil impressions.
Sebewaing Coal Co has 3% S. The waste burns spontaneously. The waste is very heavy. The burnt waste well for road metal.
The well by boiler house is 293' deep, is used for boiler but forms a white scale of salt and is a flowing well with some 2' head.
p 15. More lists of wells.
p 15 2nd paragraph; Mr. Martini has a well 330 ft deep. Mosner has a lot of lead samples said to come somewhere about the Sheheon. The lead is said to be 35' deep near the lake, according to ebbers report but 7, and 65 farther down in by rant i.e. on the head waters of the Pigeon. 1 mile E. from Wolff' .
p 15. Harberlain's Brewery well 365' but this was deeper than necessary. They stopped for fear of getting salt. It is 5° less hard than Mosners and has less S. It is cased to 160 ft., then 20 blue slate, about 300 to sandstone. The temperature is 8°. Reammur

June 16, 1896.
p 16. In Lansing. Called on Pattengill and secured maps, on Rich and on W. Gardner. Then out to Agricultural college. Prof. Beal says they have flowing wells there. One 340' deep close to the boiler house, another 60' deep. They are proposing to put down another on their new garden of wild plants and expect it also to be flowing. Around there rock is found near 40' deep. They got some coal at about 60'. Prof. Barrows says the river is on sandrock most of the way to Grand Ledge.
pp 18-19 Wells at Bay City, Caseville and Bayport.
p 20. Bad Axe May 16, 1894

12	gravel
20	hardpan
7	blue clay
3	gravel
2	hardpan
20	sandrock
36	blue shale
21	sandy shale blue
10,	sticky shale
22	sandy shale
2	hard limerock
45	grey sandrock
7	blue shale
207	

St Louis Magnetic Mineral Spring, Gratiot Co. (See Winchells paper, practically the same.)

60	clay gravel, small boulders
30	blue clay
13	fire clay
39	sand gravel
15	shale
55	coarse sand and gravel
6	small stones
2	rock
200	280 gallons per minute 50 deg. F. The iron pipe became magnetic holding small articles.

Bad Axe, John Coryell, At 270' SS strong stream of water 5' about surface.

pp 22-23 Elevations around Grassmere. and diagram
pp 24- to end. Traverses and wells in the Thumb District.

Book No. 125. June 10, 1890 - Traverses and information in the Thumb Dist.
pp 1-13 Wells and other information in above district.
p 7 Porter boring T 17, N, 3 E.

6	sand
102	clay containing gravel stones
11	coarse gravelly clay hard to drill, dried specimens look like arenaceous
13	Hard arenaceous fireclay, sand predominating (fire clay.
1	argillaceous sandrock
83½	Shale, light blue
1'1"	Coal
8'11"	Fireclay, arenaceous

Porter boring No 2. T 17 N, R 3 E, about a mile W farther up the road

0.8	Soil
7.4	Sand, ocherish colored
42	clay, stiff, gray and hard when dry
11	occasional blue clay streaks
26	clay, fine grained, gray and hard when dry
1	" " " , pinkish when wet
6	" light blue
6	" "Crown" hard
7	" bluish, a little sandy
6	sandrock 1/3 argillaceous
2'6"	Shale, piece of coal came up about 114 ft depth
4'11"	Breccia, hard(sand,clay & gravel cemented) Ground runs between this and nextm as is supposed
2'7"	Shale, a layer of coal embedded in this shale, about 2" thick and about 7" from the bottom. Tubing about 6½' from bottom.

p 13 June 16. I went out with a buggy and F. B. Taylor in the morning to trace the supposed highest lines of Lake Warren. According to him, the Lake Nipissing shore line is not visible, the Lake Algonquin is some 40-30' above the present lake level, while the highest lines of Lake Warren are about the Bad Axe level.

pp 13-35 Well information continued.
p 35 Sample X Stream mouth close to point show(or shore) in scratches Solen beds with goniatites, Nucula Hubbardi in calcareous sandstone 860 N, 850 W, Sec. 35

p 39 Sample XII Cleveland Co. , Wallace Supt. They are pumping out quarry, lots of Fe on the exposed surfaces, conglomerate streaks and bits of coal are noteworthy. They covered rock with sawdust in the fall to prevent freezing (it is readily checked, choked or (?) up) and instead of rising it lay on bottom, a nasty waterlogged mess. Conglomerate has white pebbles and some clayey streaks and is fossiliferous. Section exposed is

9"	shale arenaceous
3"	conglomerate
12'	grindstone
	Wallace says we have
25 ft	grindstone
	then soapstone ect.
At 80'	brine
3'	sandstone
Then to 95'	soapstone

pp 39-46 Well information continued.

p 46-47 June 27. Burnt Cabin Point bears E 10° S from the N end of Gull Island which is a shoal recently left bare, 40x11 ft long and not (either 5 or 7) 1 ft above water. The rock outcrops of Point aux Barques extend to S 37° E from Port Austin Light, say 400' or 55x11' from the Point W. From Gull I. the rock appears to dip → W so that the rock which is about 8' above the water at the Point would strike the water near Gull I.

At the first prominent point is 4 to 5 ft coarse white SS overlying 4 ft redder and shalier, while above it is about 2 ft thinner bedded. Rhynconella Camerifera debris comes in on a beach of Point aux Barques, i.e. on Burnt Cabin Point, about 90x11 ft W of first sand spit and opposite a white monument. At the point are low outcrops of green micaceous flaggy sandstone in place nearby, then there are occasional slabs of limestone not surely in place but so much and so angular as to make it likely that it is near. Conglomerate and arenaceous shales follow close by, and at turn near post(point or port ?) green arenaceous shales.

This days trip was made in boat to get specimens from quarry, and also to study the shore section as described by Rominger. Sample XVI

pp 47 - 49 Wells continued.
p 50. July 1.
The same afternoon of Tues. June 30, Gordon arrived and with him and Davis, I went over the ground in S c. 30,25 and 35 W. of Port Austin. We found some traces of fossils in the fine grained conglomerate. 1000 N, 150 W, Sec.25-19-12.
Sample XIII (of above)

I paced from NE cor of Sec. 25, S 25x11 ft, W 20x11 ft (1925 N, 75 W) Sample XV to water's edge and it was 77' back to where the bryazoa bed (of the flags overlying Flat Rock) strikes the water. In this same series are goniatites and solens, then going SW along the coast a marked blue clay bed into which the overlying sandstone sinks. Then above the clay are blue arenaceous sandstones down to the middle line of Sec.35 and beyond, the section being flags with solens, goniatites and Nucula Sample V as described by Rominger.
2' blue clay Sample XIV
10 to 20' flags including solens, bryazoa etc XV
30' white sandstone
½' conglomerate with fish teeth, thin bedded, slab(b)y and ripple marked beds
SE cor 23-19-13
30' Rhynconella cameriferis, Centronella plis
½' conglomerate
33 grindstone beds (hill S of Huron City)
About 20-50 Arenaceous shales, cliff S of Mill St, Grindstone City, Huron City etc.
Conglomerates and SS streak of lighthouse.
Clay shales, blue.

July 1. Wed. I showed Gordon the section of the Marshall in the other direction.
p 51 1370 Point aux Barques resort about 20' above sea level. E 40° N from it a sewage trench runs across the point to a point S 32°E of the lighthouse, cutting in one place a quartzite, really the Pt aux Barques sandstone indurated judging from the stuff thrown out. This trench is about 200x11 ft.

p 51 Contd. The P aux B bluff runs on from end of (b$) cycle course where the road meets bluff some
700' farther east before disappearing from the S side of the beach.
For (117 or 115)x11 ft on the road running 45° E, bluffs of sandstone are to be found.
Alt. 1375, same page, Rhynconella flags crop out in ditch, Road N at the N ¼ post of Sec. 26. Shingle beaches at intervals.
Alt. 1400, same page. In the present meat market is one of the old saltwells about 10' above lake level. (Contd on page 52) The other well was about 200' SW in the now Grindstone Mill.
1600 N, 600 W, S 25-19-13. Close to the shore are slabs and going almost 200 steps NW we find ledges along shore of a conglomerate layer, Nucula Hubbardi and Productus, also in flags annular orthoceras and fish teeth.
XVI. 1800 - 800 - 25-19-13
The conglomerate layer is about 1 ft thick, richest in fossils and extends to about 400 ft of the R R Station and marks a storm ? which brought in an exceptional quantity of pelagic forms. (It runs into lake going NE. The outcrops extend beyond boarding house.
pp 52-53 Wells continued.
p 54 Sample XVII The cross section as shown in the valley by the bridge is (New River bridge, Huron City)

1' soil	(reddish rock
6"	(Rhynconella
3" fossiliferous seam, weathers rusty	(Productus
3"	(Pleurostromaria etc

6" fossiliferous seam
3 ft sparingly fossiliferous
2 ft blue shale in the clay lamellibranchs as per sample.
Alt. 1428 Creek
1449 Old lake level bridge about 13 ft altitude
1485 Crest near the schoolhouse on road over bluff
1522 Crest of cliffs of flags, steep bluff down to the Algonquin level, the soil a shingle.

p 55 - 1498 S(ection?) level of Algonquin Beach
1478 3 ft dirt
5-2/3 ft blue shale
5-2/3 " " A

From	11'3"	Calcareous bed B
to	11'6"	thence blue shale C
to	14'6	
to	14'10	Calcareous bed D
to		shale, closer beds E
	16'1	Thence to
	19'9"	Massive calc. sandrocks, pebbles at base, effervescent with copiapite and free H_2SO_4 and with pyritic fossils F
	32	Blue shales 12 ft to lake G

Other measurements on p
Layer D is often a compact brown sandstone and the most and best of the fossils lamellibranchs Spirifers Syringothyris, trilobites heads and tails come from it.

The sulphides are abundant, there are traces of zinc blende, and there is a tube(?) of pyrite running down through it which shows traces of copper. (The word "it" could be the capital letter G, explaining the section just above). F shows conglomerate slabs with orthoceras and other forms, and some spirifers are rarely found in the blue shales G, which were probably deposited. The Algonquin Beach is cut out and the present cliffs show a height higher than it near a brush fence and line and corner ?, the NE corner of 11.
pp 56-57 Wells and traverses continued.
p 57, Alt. 1615 Here the grindstone occurs in place in thin slabs. There is said to be a blue slate on top. It outcrops for about ½ mile close to the ground, about 200 steps S of the road it is clearly in place. It is - slabby, much (?) fossiliferous generally micaceous green grindstone. Loose in the drift is a red friable sandstone evidently closely associated with fossils, crinoids, orthis, Productus, etc. Sample XIX

p 58 In a well a little W of N ¼ post of 22-17-13 they passed thro black loam, very hard red clay, thenblue clay on top of sand. It was dug just to sand. Large fossiliferous blocks with Rhynconella, orthis and lammellibranchs occur where they are putting down well looser (or lower).
p 59 wells contd.
p 60 Alt 1540. Immediately to S the rock seems to be at the surface, very red ferruginous and fossiliferous. Sample XX
p 61 wells contd.

p 62. July 8. We made a party to collect specimens around the Pt aux Barques lighthouse. By bicycle it is 120 wheel revolutions from Life Saving Station to fence(?) just where old wave beach is cut off by new cliffs, i.e. probably S line of 2-18-14.
1405 E side new well 5' to rock. 15-16' deep. Dynamited through fine grained sandstone with streaks of blue shale not very fossiliferous. Sample XXI
July 10. Mr. Carrington tells me that he ships sand from Port Austin. It is also shipped from Port Crescent to the L.S. Copper smelting Works at Hancock, and also to Detroit.
Bal of pp 62-63 Wells.
p 68 2043 Well section

33	hard white clay, cased 33 ft.
35-40	gray
40-45	pyrite and galena
45	gypsum flakes
45-60	"
60-69	pyritiferous shale galena
69-73	shale
73-85	very pyritiferous
85-107	fine grained dark at 89 ft.
	has water now to within 6 ft and flowing well at 107
	Sp. W 1005, SO_4

pp 68-73 Wells co ntd.

There is an outcrop of arenaceous limestone on the center line of Sec.36, Bayport, about 430 W and 1000 N, and also 2000 W to a limestone with allorisma, lithostrotion, lace coral etc like that at the quarries. Page 73.

pp 74-76 Wells continued

Mon. July 27 Rainy. July 28. Saginaw Board of Trade visited Bayport Quarries. The lithostrotion horizon occurs at top both N & S of the quarries, under them the nodule beds and thence pass into somewhat thinner bedded bluer limestones with bituminous shale parting. We collect (Numbers refer to photograph of Stroup or Strong) collection. Productus 2, Allorisma, very abundant 12, also forms like 15,16,17. Lithostrotion 22, Snail (or small) Bellerophon 3, Fragments like 7, Fenestella 8. We saw some large Ammoroid forms 1. It is noteworthy that att times the bivalve shells occur in the chert concretions. The two valves are usually together (ligament) and often not at all parallel to the bedding. P 77.

p 77-82 Wells contd.
P 82. At Cass City, Mr Auten tells me about Oak Grove near Sebewaing, a resort, they piled up the stone, but the next year a broad winrow was piled in by the storms breaking up the ice. The ice in the bay is often 4 ft thick and the stones (?) melted and left one as big as a man could carry or even ¼ ton.

Cass City is on a broad terrace. ½ mile from river is a 20 ft terrace, sand and gravel, the margin well marked. And then at Cass River another 20 ft terrace.

Diagram of Stone Wall as at Cass City.

A continuous row of large stones about 6 ft wide not infrequently very large, 5 to 6 ft of granite, quartzite, greenstone and other Archaean rocks. The part indicated was exposed in burning the meadow about 2 years ago by fire. The cut is from the Cass City Enterprize, an article by Prof. Smith, Nov. 6, 1894. See also and article Port Austin News July 24, 96, copied in Cass City Enterprize of July 31, 96. Letter to Smith from G. H. Gilbert. There were also articles in Detroit Evening Times. John E. Jeckay is county surveyor. The stone wall shows the following cross section

Diagram

J.A. Carr of Pontiac has photos of stone wall. C. F. Conrad of Caro, Mrs. or Wm McDowell has - ? from old lead mines near Cass City in limestone.
N of Cass City is a 40' ridge rolling flat base to N.
Chas. Montague of Caro should be written to for elevations of Detroit, Caro & Port Huron. road never built. Also Mr. Howard of Wilmot & Davis. P. 83

P 85. Aug 7. Followed Willow Creek continuous. See Davis notes from Huron City to Adman with C.A.Davis. At bridge and above are arenaceous flags dipping up stream and 8-10' above bridge stratigraphically shown, Rhynconella, Nucula H. etc.
XXXVI Sec 4, 1500 N, 800 W.
XXXVII Then a blue clay shale and apparently lower beds as we go up stream. Then turning SE the arenaceous flags with N.H. once more and 8' bluffs at a wire fence S. section line of Sec. 4 Huron flags ^ ?
XXXVIII Flags in stream bed 400' farther dip 1 in 8 . Travertine from springs in bank. Flags more argillaceous ^ NW about 1:12 undulating and ripple marked. Then coming in first on top Grindstone thin bedded but much thicker than heretofore. Clay seam associated. Tributes from SE comes in and it gradually gets down to the river bottom; about 300 steps thereafter on cor of Sec. 9, E & W fence near which it is thin bedded in the bluffs. 20-40 steps on another stream and round sandstone balls.

p 85 Sec. 8. About 200' N of bridge a coarse almost conglomerate overhanging talus. Sec. 17 348' S of bridge all massive down to stream, like P of B, at least 12'. Not much above it are the Centronella beds and a streak of blue clay.

Sec. 20 The first outcrop of Ss beyond is first in top of bank, then creeping down 154x11 from center of Sec. E & W and apparently opposite center going N & S. It becomes massive bluffs creep slowly and disappears about ¼ mile N of S side of 29

About 320 steps S of S side of 29 sandstone coarse and heavy appears again first in stream bottom then rising and continuing on eastward. traces of the streaks at sec. line of 32 3 ft above water and going farther S it disappears in the bank W.

pp 82-90 Wells and traverses.
p 90 Caseville. Babbitt sandstone quarry. Bert Smalley interested, owned by his sister, his father's homestead quarry in lot 3, 15-18-11, a coarse white(buff or olive) sandstone, friable. Stewards is a blue grindstone SS on 18. Lambert picked up Lead as big as his fist on Shebeon near SW Sec 11-16-9

pp 90-96 Wells and traverses .
p 96. Dr. W. C. Wright of Unionville got galena from Indian halfbreeds in the winter of 1888. Found in two places L. They went across from Heistermans Island. 2 . Some place where the Au Sable River cut through it. Indians used to row over Pine Island 11-13 above the lake.

pp 96-100 Wells contd.
p 100. On road to Port Crescent, Alt. about 35' on Cg Marshall, granoid plates N. Hubbardi in not absolutely in place.

Aug. 22 On S. 31, Port Austin 25 steps S of center and about 27 paces E of center is a bench at 75' elevation heavily covered with shingle, thin slabs of fossiliferous Cg Marshall, Nucula, N. Hubbardi. The bench extends very sharply about 200 steps N and 800 W, passes thro 1000 N and 1500 W. The shingle ridge runs from 100' S of W ¼ post of 31. S 35° E 200 steps at 750 steps N, i.e. 250 S of ¼ post is the worm tube SS while near S line of 35 about 300 to 500 W of S.E. cor is coarse SS. Thus around hill on Sec. 31 runs a fairly continuous band of fossiliferous slabs.

Along N line of 36 about 580 W is a sand line 200' wide near the Nash fences. And on the second beach (or bench) just back of Flat Rock the Solen beds with goniatites, Productus and Nucula appear. S of Flat Rock Calcareous beds come above Solen, Goniatites, Orthoceras etc. About 300 steps N of a fence in Sec. 35 are peculiar strata about 2' thick of angular fragments of sandy flags mixed indiscriminately in a soft blue clay matrix. St 4° dip to E of clay. St. fu Hardwood Point Sec.35, N. 35° E contains fossils as collected. We trace rock ledges out under water. Along here the dune is cut and shows an old vegetation line 4 ft below the present which has 1 ft pines. Back of the clay outcrop is a gap in ridge and a massive brown sandstone not > 50 steps from the shore continuing along to a terrace on E line of Sec. 35. On this bench is fossiliferous stuff like that on the road found by Davis evidently a lower level of the same i.e. at 86410 and about N from it.

Aug. 25. Collections on Chanty Islands, in general these collections are precisely like upper Bayport Rock.

LX SW of Lighthouse, trilobite tail, much chert nodukes, much lithostrotion, Aulopora and other corals, nodules enclose coral.

LXI On the first point 6' of bluish shaly limestone, many allorisma nodules, geodes, lithostrotion etc.

LXII About 50 steps farther along flags about 3 in thick, very hard and ringing, flinty, appear under the lithostrotion undulating but apparently S to SW NW. Then on top of flags replacing limestone pure white sandstone

LXIII Strongly cross bedded, about 10 steps on in lower

LXIV Sandstone beds allorisma, large. Flinty and cherty layers overlaid and underlaid with more sandy ones continue to SE point. Thence it is sandy to Fish House on SE Bay. Page 101

LXV Is next to little Chanty Island. low outcrops of a brown brittle dolomite with cavities and the beach to the W point is full of calcedony pebbles and calcite geodes. On the long point to S. rock just like LXV emerges weather yellow brown.

LXVI This limestone is but slightly fossiliferous with frequent calcite geodes and extends nearly to head of the bay opening SE and the fish house aforesaid.

Aug. 26 Rainy. Gordon's specimens from Cass City look like the Soule cement rock, containing large Spirifers coarsely striated in the veins.

pp 102-110 Wells continued

LXX Sept.4. Went to the islands off Bayport. On N. Side of N Island is a quarry with lithostrotion, nautilus, orthis nodules and corals abundant, geodes of carbonates and on the W shore of the island is a slabby pavement of the

LXXI Same continued out under the water, Trilobite tails, allorisma etc. As we go SE along the shore 100 steps to cove we come to the rich lithostrotion stratum, this apparently overlying as at quarries and dipping to NE.

LXXII Going N from Fish Station on a goose neck(cf Win. 1860, p.138 red bed) where this island has grown we come to a dark brown dolomite ferruginous not fossiliferous (LXXIII) limestone. At extreme end of neck large boulders of driastolite schist & c but with enough shingle of fine white limestone mixed in it.

LXXIV The shore down to Heistermans is of fossiliferous bryazoa limestone, corals, allorisma dip ?. The N end of Heistermans shows thin bedded limestones and sandy layers.

p 111 Coal reported found on Salt River, Tobacco River and Tamarack Creek.
In Post & Seeley's Bank Bad Axe is a nugget of pyritiferous quartz, very heavy.
Indians started from Port Austin, were gone 3 or 4 days and the direction they headed led people to think the lead ore was obtained along the Pinnebog R.

pp 111-116 Wells
p 116 LXXVII 9803 50 ft N to outcrops in river of arenaceous blue ripple marked micaceous shale, earthy and somewhat bituminous, irregular, also practically in place to the W near bridge.
LXXVIII N ¼ post of 24
LXXVIIIA no drilled well here on N. fetid odor.
1655 N. ¼ post of 24 of thin bedded blue ~~limestone~~ brown, slight bit fossiliferous limestone

P 117 Brickyard made 500,000 this year, mostly cream colored (1896) Ginter and Heist. Brick has been sent to Unionville and Fairgrove, also of J. Ryans house in Bad Axe. They get their clay from the adjacent swale under 2½ ' of dirt is 4' clay. A At the south end a bed that yields a light red-orange brick LXXXI. They are more or less bothered with limestone pebbles.

pp 117 to 120 List of specimens with numbers and location.

Book No 126. Chas. A. Davis, June ,July, August 1896.
On Fly leaf under date of June 23, 1896.
Spent the morning with Lane testing the waters of various wells about Port Austin mainly in town. The results of the tests are recorded in his notebook. Noted that the Flora of the sand dunes belt next the lake was that characteristic of the shores of the Great Lakes, Cakile (?) Americana Lathyris, maritina, etc. Saw at house of Mr. Learned some fine fruit trees in flourishing condition, apple cherry and plum; strawberries and raspberries.

In the afternoon made a trip westward on shore of lake following the old road along ancient beach, bordered by high dunes. Soil very poor and supporting a Flora equivalent to that of the Jack Pine plains in N part of state. Found a few small specimens of a Potamogeton in a sheltered place near the shore of the lake, very unusual. Spent some time at an exposure of thin bedded sandstone collecting Solens and other fossils, exact location recorded by Lane.

June 24. On trip today Dr. Lane kept running notes and results of examination of waters. The soil back from lake shore seems of good quality and fertile. Orchards are thrifty and in excellent condition showing few signs of the usual pests. Soil mostly a gravelly clay, rather light and apparently easily worked. Canada thistle very common in pastures and fields.

Entire book is devoted to location of wells around Port Austin, Port Crescent, Owendale. Unionville, Pt of Pines etc. Gives water content, point of elevation, and describes in detail the terrain passed over.

p 75. Pt of Pines. Examined the wave terrace off the hotel. Top of terrace covered with large smooth slabs of a rather hard compact thin bedded flagstone. The slabs are many feet across, in some cases rectangular and fairly regular in outline and evidently in place, although much broken and cracked as a whole. The layer seems identical in compactness and hardness with the silicious flagstone layers at the level of the lake a hundred yards E of Broken Rocks. The material under this flagstone could occasionally be seen and seemed like a soft dark colored shale, friable and easily broken to bits. Only small pieces could be broken off on account of the difficulty of working under water.

p 91. Sketch with the following note on a loose leaf.
The sketch is intended to represent condition of things at 727.90(Foot of steep gravel ridge. Course about E & W until within 100 ft of road on E side when it turns to NW, then abruptly N on road line 75 ft W of Station Road runs along top of it several hundred feet, then it disappears to the N). The ridge is a possible Kame very near the NW cor Sec.30, Sheridan Twp. It was a very sharp "Hog-back" running as described in the notes, and formed one of the most striking gravel ridges, if not the most striking one seen. There was a small swamp partly enclosed by the ridge. The peculiar and sharp turn of the ridge may have been due to a culmination of ice and water action at that point - I wish I knew what forces or combination of forces produced such sharp and abrupt ridges of water assorted gravels, but I dont.

pp 102-103 Aug. 17 Port Austin
Went to exposure in Sec. 36, Port Crescent road and spent the forenoon collecting fossilsat the outcrop on the S side of the road in Sec. 35. Further developments show the bed bearing fossils to dip sharply to E at an angle of nearly 5°. The bed is about four feet above the grade of the road near the W end of the outcrop and the fossils in it are characteristic and abundant; not very well preserved and badly rusted, but of different type from those collected in the other beds of the series examined before. The characteristic form being a small bivalve mollusc of the Nucula type but with a winged hinge. It would seem as if this bed was above the Solen beds west of Flat Rock and there is possbile connection in the shaley terrace to the NE of the outcrop. The fossiliferous stratum is at least two feet thick and may be thicker and is a rather coarse dark colored bluish or brownish sandstone, almost a conglomerate, in places rather thin bedded and shaley, from frost action ?. It seems to dip to E and S but the dip may be only seeming.

p 119 List of numbered specimens and where found

XXXVII Sec. 4, T 18-19 N, R 14 E Tufa

Book No.129. This seems to be the pencil notes of the Huron Dist. which were later copied in ink in Book 124, at least the information is duplicated.
pp 82-103 contain diagrams and depths of the various county drains in this county, copied from records in the Clerks office.

Book No. 131. L.L.H. with Mason and H.S. Goodell. Traverses in T 58, R 28-29, Sec. 30,29,26,35,25,32. Base Hill and Copper Harbor. Sept 23, 1896
pp 111-113 List of specimens.

Book No. 132, Marked "Graves" Marquette. Contains many diagrams and sketches in color locating the various sections exposed at the mines in the locality, Middle I. Pt and Lighthouse Pt.

Book No. 133. M. L. Fuller Field notes on Conglomerates, etc between Houghton and Rockland Mich, June 5 to Sept.1, 1897. T 53,52,51,50, R 35,36,37,38,39,40 practically all sections.
pp 1-100 Traverses, diagrams and description and location of sandstone and conglomerate outcrops and other outcrops in the Sections listed.
100-104 Numbered list of specimens with locations.
This book is written in very good handwriting so could be referred to without difficulty in that respect.

Book No 134. L.L.H. T 55, R 33, Sec. 8,9,16,17,
pp 1-21 List of numbered specimens with descriptions and locations
pp 22-27 Diagrams of Peninsular, Franklin Jr and Kearsarge Shafts.

Book No 135, T 54,56,57, R 33,34, Sec. 11,16,3,34 L.L.H. 1895
pp 1-7 Atlantic Mill, Coles Creek notes copied into Book ~~124~~ 112
pp 9-15 Diagrams and locations of exposures in Atlantic Mine, Osceola Mine and High R. Bay Pt.

Book No. 136 Contours Little Montreal

Book No. 137 T 55, R 33, Sec. 19,30,20,35,36, May 29, 1897 L.L.H.
pp 1-6 Locations of conglomerate in above sections.
p 7 Elevations above Portage Lake.

Book No.138 W.L. Cumings 1899. T 50,51, R 38,39,40 Sec.nearly all.
Diagrams of outcrop in above sections.

Book No. 139 , F. W. Dentons notes, Allouez Gap Area, 1897
pp ~~1~~-22 Computations by instruments
pp 23 to end, Elevations only. No description.

Book No. 140 F.W. Dentons notes Allouez Gap Area, 1897
Entire book Elevations with diagrams of same.

Book No. 141 Allouez Gap Area, Notes of G. W. Corey, 1897
Entire book, Elevations

Book No. 142 Copy of Danglers Notes. Following Cong. #6 according to L.L.H.
Distances and diagrams of same. entire

pp 144-149 Sec 11-47-26. Geol. Sec of the islands near Teal Lake, Bessemer, Palmer, near center in 8,9 and 10-47-26 to N of Goose Lake; then in Sec.11,12,13, 24,23 to Foster mine, Ironwood, mouth of Black River and Chippewa Bluff.

p 145 May 21st. Letters to Killmaster on his well which is rising 350' less to the given horizon then at Killm. which agrees with a 39'-40' to inch SW dip. To Walcott, Chamberlin on Corp. (?o) Rose re call on Governor.

Mr. R. J. Shahelin reports on Bridgman 639 A T
First shale grey, 200 ft.
300 shale, gas enough to left hat off of 8 in pipe
Black shale South Bend 280
Trenton rock at 500 S.B. 385
At 550 salt water, S.B. 387 (Compare Niles 144-500 Berrien Springs 620
Gas at 760 S.B. 610
Salt water at 800 S.B. 670 salt w.
See news paper records
Corresponding horizons about 120' deeper than at S.B.

p 148 Bridgman well
0 green shale not eff.
1 520 fierce eff
2 538 " "
3 560 " " ? facets
4 650 very fierce eff.
5 700 " " "
6 768 moderate eff. darker. one good sized piece of selemi ?
About 3 below R.R. track i.e. 636 A.T.
50 above lake 630 A.T.

40 rods S of station

Surface sand	3		
Clay sticky	100	103	
Sand fresh water	5	108	
Clay blue	50	158	
Sand same(some)fresh	5	163	
Clay blue	40	203	
Sand fresh water	20	223	
Gravel cement(?)	5	228	? Rock clay down 275 ft? 25 - 30
To Bedr 8 in. Clay blue waxy	30	258	
Clay, big streak	50	308	
Brown shale, gas near top	2 0	508	Indian Blue Sh, bituminous 30
At 325 according to papers			Darker shale diff between gas
scum on water after striking gas			Ohio black to 300
8'in reamed down to case off water			
Trenton bastard	5	513	
Salt sand	25	538	90 in T 578
Brown sand, salt water here	25	563	Salt water ? about ? to top of pipe
Trenton porous drilled mis	?200	763	130' more 688, gas ? rise 20'
Salt water in bottom of			in salt water 698
this with gas above	5	768	600' of it in hole

200' S and west from point where gas was originally struck in white(or which) rock at about 125'.

Dowagiac	565-640 - Br	-303 or 339	- S.B. 337-280
	800 - Br	508	- S.B. 350
	874 - Br	538	387
	1000-1080	768	540-610
	Diff ave zon ?		150

p 151 May 27, 1904 Boyd Hole # 2.

Sand	1		
Clay	47	48	
Chip(?)	32	80	
Blk Sl	2	8	1 mixed with pebbles
Lgt Sl	13	93	2 white, few coarse grains sand
Sandr	5	100	3 same as 1
Lgt Sandy Sl	2	102	4 sand color, few brown speck iron carbonate(?)
Blk Sl	6	108	
Coal	1	109	6 clear bright, little sand
f	2	111	7 white like 4
Lgt Sl	12	123	8 darker , black?
Lgt Sh	15	138	9 Same as 8, probably only difference in l(ime)
Blk sl	1	139	10 dark, small smallsample LV
Lgt San.Sh	2	141	11
Sandr	6	147	
Chip sl	4	151	12 blue grey sl
	2	153	13 wet mass, plastic clay
Blk sh		167	14 top of coal, black, hard, coarse bits
		167	14 coal thin bedded, clear and fine
		169	
	2'5"	169.9	15 big sample clear(n) ?
	2	172	wh sandy shone.

p 151 Boyd No 4.

Clay	41		Samples 1, clay like Pan
top	32	73	
Sandr	11	84	earthy
Blk sh	17	101	blk
c(lay)	1	102	black sh with a little coal
f c(firec)	7	109	somewhat plaster, grey and white
coal	½	109½	rather poor and shaly
sand	3½	113	white sandrock
S sh	12	125	rather dark
blk sl	4	129	blk sl soft plaster
f c	4	133	light wh sh
l sandst	8	141	excellent sand
c	2"	141 2"	
F c	16"	142	white and sandy
sandr	9	151	
sl	5 2"	156 2"	
Br coal	1	157 2"	shaly coal
sandy f c	10"	158	
blk sh	13	171	black shale
c	2½ "	173 8½"	
f c	3⅛"	174	very dark.

p 153 Analyses of Cannel coal streak in Wolverine Mines known as No 2 by Kirshbaum Int at 212° F 20

H_2O	6.76
Vol	42.67
Fix	42.01
Ash	8.65
S	3.50

B T U 12,295. Sample of carlod lots. This is the Verne.
Germaine Wks in 1891, 3 wells, signs of oil, black oil 757 ft deep.

pp 153-157 Data on Salt wells with note that it is taken from a book of scraps on salt industry in Hoyt Library at Saginaw. Also notes from Leverett on chemistry of salt.

pp 159-160 Data on wells at Grand Ledge and Owosso.
Richards from Grand Ledge comes in. A well which is in front of pump house.
Started in 6 inch casing, gone 300' now (are waiting for casing)at waterworks.

clay	2		
gray sl	23	25	
fireclay white	30	55	
wh sandr	35	90	
grey sh.slate	15	105	
soft sticky blue	135	240	
Alt.layers			
black & slate	15	255	This belt includes 3 seams of coal not > 4 in.thick.
Soft sandr			
like flour	15	270	

Silt
This is close to bridge and to island

4 wells were put down upon vein 1200' from plant. Run from 147 to 173 ft. Run to white sandrock which runs off up river 22' in 130. The white sandrock comes in gray shale and fine 40 to 63, rest of the way white sandrock 147 to 173.
90-113 ft. Is(?) rails 13' above the upper mill pond.

At church 3 blocks back	sand gravel and c	1st ?	38	
	Shale & fireclay		22	60
	Clean slate		90	150

water mineral with S ?
few layers sandrock. no volume at bottom Dip to S.

(See notes Apr. 1907) At Owosso 3% salt near Ann Arbor Car Shops at 246 ft.

Sand and gravel	to 80	
clay blue	to 212	
gray sandr	to 246	Very porous, very salt 8' head, plugged.

½ miles from ? rock mined at surface, up to Corunna Made grindstones.
150 rods S of this same Ann Arbor Works, flow at 80 feet.

Notes on letters.

DeCamp says that NW of Albion, in Lee Twp, Calhoun Co, was a lake when a rain contd.

For further notes on Richards see 1903 p.71. N B. Walkers unfavorable opinion of him, also 1903, p. 156.

Regarding driving rod, Mr. C.C.Wood reports that he thinks his father's uncle Mr. Jacob Wood at Farmington, Mic. or at Grand Ledge had a well located with witch hazel, and he is still alive.

June 15. Went to Grand Ledge with Gordon. Saw the cliff fall, also the wearing of bark by the flow(or flood) and the damaged dam. Before I went, watched sounding the capitol well repulled by Board of Health. It was 26' 11½" deep to bottom and water stood 26" in it, i.e. about an average 26' down.

The temperature was by my Therm. 7536 48° 2
by their " 48°
An iron spring near the lower dam and the clay pit was at 50°.
The Ball well was at 50°.
Pumping continuously from the water plant wells into tanks was a stream at 51°.
At Mr. Kent's place on Saginaw St, 1 mile west of the Fuller place and about
1 mile south of town is a well originally 12-16' deep. Then 40 ft to rock.
At 70' water rose to 7 or 8 ft not clean.
At 90 water only 40 feet from surface and
at 109' it was back again.
On blue print map of Grand Ledge I locate the new well.
On Jefferson St. it is 32' to rock, 40' in rock, Lot 12, Block 27 ?
While at church there was no water in these points on the map. Back of Lot5, Blk 39
I take sample of Richard's last stuff. (See 1903, see 9, p.156, also 1904 June 7.)
The 4 wells are along River St. No. opposite cor 1 & 2 Block 53, then along
River St. S.E. 100, 110, and 130 feet.

pp 162-163 List of wells in Lansing with temperatures of waters.
pp 164-172 Miscellaneous notes and memos about wells and calculations.

p 173 July 23. Harrisville well, on fair ground 640-645 ft.

Yellow loamy soil	12½'	)	
Quicksand	14	26½)	Post glacial or
Red clay) 10'gravel	6½	33)	lacustrine
gravel)	6	39)	
Hard pan and boulders	60	99	1st till
saw signs of oil	30	129	(J H.K. Jan.30 at 72 rock glacial sand with lime. See Sample Feb.1, '04

Blue solidifed hardpan at base(J.H.K. Feb.19, '06, quicksand
Red hardpan 59 188
8" pipe down to 132' boulders lodging under couplings, not able to drive.
Red clay 4 192 (Mch 28, J.H.K. gravel with little clay.
Blue hardpan & pebbles 38 230 (
Also fragments of sandstone, 7" casing down to 209', bulges in so tools would
not turn in them.
5" pipe down to the rock at 230 ft.
232-240 White SS, micaceous, 2 mm, slow eff.
230-232 FL, Apr.23,04 fine grained SS, some lime
240 FL Apr.27,04 dol
240-245 Mainly but slightly rounded gr, yellow stain 1/3 mm
230-260 FL May 2,04 Berea striking resemblance, slightly calcareous, 240 dol.
256-260 quartz ? and XX. 1mm
260 Fine blue shale, not eff. grey light color
260-295 FL May 2,04. Blue clay shale such as might be crop under Berea
275 Plastic white clay valuable, not eff.
275-290 " " " " " "
290-327 " " " " " "
327-409 All those break up more or less into a soft plastic mass.
409-427 (J H K. May 19,04, May 20, A.C L. Antrim 350, black not slacking, not eff.
409-450 in Drft wet
450-500 " " " " " "
500-506 Dark brown bit. sh. not eff. " " dry

Brick plant of Valley Coal Co. south and west of Salzburg. Knapps test holes of
the Auburn Coal Co. office in the Shearer Bldg.

Samples of drift, interglacial deposits, if any, and the bed rock in new shafts going down. The Auburn mine, new mine in West Bay City. (See Knapp) and Fossls ? mine, east of the Saginaw river and near the Bay, Saginaw Co.line

p 175. Memo on correspondence.

pp 176-179 - Elevation around Saginaw and calculations.

pp 173- 195 Cascade Range, Champion Mine, Houghton, Chapin Mine, descriptions and diagrams.

pp 196 -213 Loon Lake Range, Gagnans Islnad, Sultana Mine, Garden River, Echo Bay, Desbarats Bay, descriptions, traverses and diagrams.

pp 214 -242 Black River, Ironwood, Marinetts, Mt McKay, Warrington Descriptions, guage readings, well information from these places.

pp 243-254 - Location and brief description of Wells in Ingham Co.

pp 255-256 Data copied in ink which he notes refers to page 183.

pp 257-268 Information about wells at Al bion, Battle Creek and St Joseph.

pp 269-274 Wells Ingham County and Ypsilanti

pp 274- 307 Black River, Sec. 17, 32, 31, 29,510,9,8, Around Bessemer Traverses, readings, descriptions and diagrams.

pp 308-312 Temp. of water of wells in Lansing.

pp 1-10 Miscellaneous notes, seem to be reminders. Return from meeting at Phila.
pp 12-13 Analyses of Battle Creek Waters
pp 14-15 Miscellaneous notes on wells.
pp 18 Section Port Rowan Well
p 19 Section of Well under Date Feb.3.
p 20 Sec. with analyses of Woolmuth Quarry, Maybee, Mich
pp 21 - 28 List of Salt Companies, Books and pamphlets in his library and misc. data on wells, including Howell.
p 29. Feb. 24. Mr. Jerome Campau brings in a fragment of a six-sided prism of quartz 2 inches diameter, plowed up near Okemos, Hathaway farm. Works in the Auto Body finishing Co.
p 30 Mr. Richard, clay shale 6-24N-2W, 100 rods S of N. Section line.
He also talks about a material which is undoubtedly the bituminous calcite that occurs in balls on the Antrim shale.

p 33 Apr. 7. Visit White P.C. factory at 4 mile lake, 2½ miles N. of Line (or Lima) Center. This factory uses kilns and burns cement, each kiln taking a day to fill and 2 days to burn. Yields 295 bushel (4 sacks of 90#). The cement is ground in a tube mill, half full of Silician pebbles, $20. a ton. South and SW from the lake there is a large extent of swamp with peat 2 to 3 ft underlain by marl bog lime which is said to run at times 99.87% $CaCO_3$ when dry. Banks(or bricks) of cement are exposed 6,7,14,21,28. tools on Fenbruchs machines running up 900 plus lbs on 28 day test. The marl in one place is thin and an island of very smooth blue large clay which has required especial machinery to work on rises so that there is the ? 1-2 ft peat; 1-2 ft bog lime with many shells and a layer of Unios at bottom. On back of page. Theory of Origin, Distribution and supplement.

pp 34- 36 Misc. notes and memo on Cement.

pp 37-41 Analyses of various rocks (no location). Mentions a well at Fowlerville.

An insert pp 1-49 is headed" Notes of Samples left from Winchell's time. Numbered and described. Samples from salt wells and lands around Saginaw and in the Thumb.

pp 51- 66. Analyses of waters, Hillsdale, Ann Arbor, analyses of coal Chelsea , Jackson, analyses, Victory, Grosse Isle, Osseo, Charlotte,

Insert 71-76 Notes on Huron River, last page, notes on Winchells Ann Arbor samples.

pp 77 -104 Description of samples collected at Arcadian Mine.

pp 105-115 Traverse and description of Cal. & Hecla Mine

pp 116 to end Traverses and description of Central, Franklin, Tecumseh and Keersarge mines.

p 120 Index
p 121 Abstract of N.H. Winchells Journal of 1869
pp 122 - 135 Description and section at West Yards, Granite Point, Fels on E & L Margin, Delaware & Conglomerate Mine and Medora Abstract.

pp 136 - 150 List and description of specimens from Mandan Mine

pp 151- 165 Trip to Mandan, Medora, Wolverine and Resolute and list and description of specimens from Resolute , also LaSalle and Manitou.

pp 166 to 172 Notes on the water at the various mining locations.

pp 172- 181 List of minerals and description and diagrams, Republic and Michigamme and in the vicinity.

pp 182-219 Cross cut, list and description of minerals and list of specimens from Tamarack, Caldwell, Franklin Jr, Atlantic , Clark, Isle Royale, Superior.

pp 220-238 Observations at the Baltic mine.

pp 239 - 246 Near Bessemer. Description. Letter on 239 to Mr. Davis explaining about a peat bog found on Sec.18 - T. 48, R 48, with vegetation on same. Suggests it would clean up into good arable till plain. P 244 has a section of samples of Coldwater well.

To H.M.M. Lane Letter re topo survey maps Letter probably between Nov.19-22

Back of page 244.

I wrote him that our relations in Mich. had been very pleasant.

I could not however, knowing as I do how Bramer and others feel, speak as positively or for the whole country as I would like. L have just today heard of a letter by Prof. Hobbs, which is already in press in 5', and which it is too late for me to do anything to recall, even if I were in a position.

I expect to be in N.Y. after Xmas and think it might be well for Wolcott to invite the S. G. who shall be present to a conference with the view of better understanding our interchanges. I wish you would show this letter to him personally.

I should even like to insert in this contract for farther topographic work a provision, whereby in case I am in a position to turn over certain maps or plane-table lines of levels, based upon instrumental work(not barometer) and of sufficient accuracy that that ~~might~~ may be credited us on our quota as against the levelling of an equal area by your survey. I may say that I have specifically in mind the area contour around(or near) Calumet by McNair and his gravity work. This is done in 5' contours and is plenty accurate enough for a map.

A C Lane

pp 247-256 Description of specimens fron near Sec.20- T 48 N. R 30 W.

pp 1-12 Memo regarding matters to take up in connection with survey.
p 1. Matters to discuss with Grabau: The Winchell Grand Traverse report, the Rutot report, Salt Shaft matter, Getting out final report, an extra grant $25. stratigraphic.
Matters to discuss with Walcott
In preparing geological folios suggestions should be invited from me as to who should do it. There should be at least one local man. (E.C Sherzen, Detroit)

There should be references to important previous reports.

Before any work is undertaken in the state I should be notified. My consent not absolutely neeessary.

Often lack of knowledge of what is being done by other departments in the same region.

Before any press bulletins regarding Michigan are sent, they should be submitted to me.

Better less said about what is to be done; more about what has been.

Definite understanding about iron and copper regions.

p 3. Matters to discuss with Hobbs. The seismographic committee.
The contract with Fernekes.($100. About 200 deliv(or delin). these already due and not paid for to be counted, provide payments at S.G. ? . Arrangements with the U.S.G.S. (OK) The Marquette(Seam or Seamon), Houghton and Detroit(Sherzen) folios. Position on the sectional committee.(Russell'S). Position on the council.(Membership thereon, deliver talk on). Work on faults(in U.P. Kenwenaw Range, greenstone. Show Minn & Mich ?) Russells map. Folding panorama of Gogebic Range, not found).

p 4. $75. Photos of all drawings made for Mich. Geol. Sur. Look over material from slat shaft and present brief report on correlation of same in time for presentation as paper on Mich. Acad. Science spring meeting. layouts ? with Sherzer.

p 5. Mich. Matter in storage warehouse of W. H. Miles. Upheaval of rock in body of stream and commotion. Editor wrote letter Central Michigan about it. Uplift in stream, no quarry, no blasting, commotion, noise, shortly after last paper. Noises goes on. Seismologic notes

p 6. McNair consents. Prof to accept our work for what it is worth, and to do an equivalent amount of work in preparing a rectangle around Calumet.

p 10 Jan. 17th Estimates of bill

Case (Art metal Construction	250.00
Cement walks (2 x 50 x 6 x 10¢ app)	60.00
Rewiring(estimate)	100.00
Brick veneer(Gundlach estimate	700.00
Furnace installation estimate	200.00
Lot (Nichols Ophir	750.00
Building 60 x 34 x 22½	4590.00
Stock (or stack)	5100.00
	9750.00

p 11 Note. G L.Wills, one topographic sheet saved $4000.

pp 12-19 Information about Republic mine and around Houghton.
p 21 - Wells at Escanaba, Pickford and Ionia.
p 22 estimate of sediment in Keweenaw
pp 23-28 Oakwood Salt shaft and Grayling well
p 29 to 35 Data, miscellaneous on wells, Ford Factory, Black River, Detroit Owosso, Goodale and corresponding locations on Canadian shore.

p 36 Data of well and strata of the Saginaw Mines.

pp 37-38 Data on coal in the Saginaw area.

pp 39-43 Data and analyses of brines and wells around Saginaw.

pp 45-51 Data on drilling and analyses of well Sec. 19, Cheboygan Co. Afton, Rabbit Back Point, Ford Well, Solvay Process well.

pp 52 - 62 Oil and Gas well data. Ypsilanti, Port Rowan, St. Joseph, Manistee, Ecorse, St. Clair, Gladwin Co. with analyses.

pp-62-63 Miscellaneous notes around Mackinaw. Lumber Discussion

pp 65- 70 Sections of holes in Nonesuch, Arcadian, Caldwell, Rhode Island locations.

p 72 Miscellaneous memo. Note. Hope if State legislature meets, it cuts an equal sum to put in $250 to extend the Topographic Survey. Now covers Detroit and Ann Arbor as far as Agricultural college and Lansing. Hard to spare money. Many states have granted more than they can meet.
Work in one County continued. Lake Superior Monograph.

pp 73-82 Wells and analyses at Horse Race Rapids, Wis. and St. Ignace

pp 83 - 145 Glacial surfaces near Mass, Houghton, Aztec mine, Belt Sta. sections and notes on Wells in the locations , also Bohemian and Empire.

pp 146 - 149 Analyses and sections of wells at Pickford

pp 151- 165 Section s at Tecumseh Mine (Abstract)
p 166 Wells at Pickford and Rapid River.

pp 167-176 Sections at Hancock and old Isle Royale Mines

pp 177-181 Preston Well, Alpena

pp 182-189 Wells and misc. data, from Dewitt, Monroe, Morenci, Manistee and Detroit.

pp 190- 208 Greenland Co., Rockland, Michigan sections. List of specimens found in Isle Royale dump (p 198), also collection of calcites of Capt. Chynoweth, also Newberry well.

pp 209-to end. Misc. data on wells in southern Michigan, with analyses of waters, cement tests, diagrams, scattered localities.

Sept. 10 - Oct. 12 1897 Eastern Huron County and Northeastern Tuscola Co.

p 1. Description of rock at St. Ignace, and Tawas City.
Around Sand Beach outcrops frequent along shore for two miles.S. Most abundant Chonetes illinoisensis Van, Productus laevicosta , 2 other species, Productus Blairi L, Spirifer centronota, Syringothyris, lamellibranchs, crinoid stems and heads, LI Rock Falls, LII Rock Falls farther S, LIII, Rock Falls, farther S. Curious serpentine worm tracks and Canda galli imprints.
Chonetes ill - C. pulchella Win.
p 2, Bar. readings , Sand Beach
p 3-4 Traverses around Sand Beach and Rock Falls. P 4 No.1435. Lake has been eating, a lot of 2 acres just opposite is practically gone. Thus on Mary Van Wormer's land , 33 acres is the Van Wormer lot according to the county map. Some places 6 ft a year on top of bluffs.
No 60227 Brink of bluff 76 ft from road. Basswood on E. side; in last ten years site of barn and barnyard all gone. Each spring they cannot plough as far as last year, so says a lad. Difference 3 to 6 ft a year.

Ward thinks there is no gain of lake on land; it is all frost action, prying clay off the cliffs.

p 5. 1495. Top of bluffs nearly at county line. Old German has been here 15 years and says cliff is working back 3-6 ft a year. 18 ft of shale section exposed all along creek from road to bluffs and in the bluffs. Sample LVI

p 5. Geo. Jenks says that on recent survey (Feb.1896) 1730 ft was distance E to edge of bluff on line between 7,18-16-16, plus about 30 ft to warer. Farther up in harbor a big double tree which was about 15 years ago only about 50 ft from water is now ? 150 (145 measured) feet.

p 6. Sept.11 From double tree near resort pier about 8 ft above water and 400 ft N of pier (basswood or linden) that Geo. W. Jenks says that in his boyhood was about 50 ft from water (from shore marks probably 45) is now 140 ft to limit of vegetation, 145 to waters edge.

p 7. Capt. Wagstaff shows me chart 1875 and gives me blue print of Sand Beach Harbor. Jenks lot is estimated to have lost according to figures given me about 9 ft per annum. Chonetes found here. Sample LVII

p 8. 1355 Shore, Port Hope, outcrops to S of pier. Chonetes pulchella, crinoid spore, Productus coiled form, Gastropod ?. Also outcrop 5-8 ft in stream, blue sandy mimaceous shales that weather brown. Sample LVIII.

p 13 Jo Greis refers to Col. Lydker, U.S Engineers, Detroit, Resurvey of coast made 187(or 9)1 - 1889 Forestville to Port Hope.
Trees at Sand Beach out in water near pier. Also at point just N of Town line Sherman- Rubicon called Drowned Point, stumps out in water. The building of the breakwater caused a cut of 15 to 35 ft along the shore to the north for the first few years until the lake dropped. Shall at his drain.
Reports of considerable at near Rubicon-Sherman line. Shingles used to be cut.

p 15 Sept 20. According to Oldfield the fishermen find nodules of limestone corroded, honey-combed like bells from a reef about 28 miles out.