Notebook No. 204 - Leverett

COUNTY

Chippewa: 1-23, 25-26

Delta: 52-54

Luce: 17, 20, 21, 22, 23-35, 38, 39-41, 55-59

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NOTEBOOK NO. 204

(August 28 to September 9, 1905)

Aug. 28. Trip by rail Sault Ste. Marie to Wellsburg and tramp south with Mr. Raynard and west past Bolton to McBride's camp and on to Rexford, and on train Rexford to Eckerman.

Aug. 29. Tramp with Tower to Strongs and then north and west to the telephone line and back to Eckerman. Notes southwest of Eckerman.

Aug. 30. Drive southeast from Eckerman through hardwood to old camp and back to Strongs. Then southeast to edge of jack pine and north past Rexford and west to camp in woods. Flowing wells at Strongs.

Aug. 31. Strongs to Emerson. Flowing wells. (See also Notebook 203, pp. 96-97.)

Sept. 1. Flowing well at log boom. Trip up Tahquamenon to Lower Falls and by log train to Shelldrake. Boring at Shelldrake.

Sept. 2. Shelldrake to Emerson and Eckerman and by train to Newberry.

Sept. 3. Sunday. Notes on Newberry waterworks.

Sept. 4. Data on wells and shore lines collected at Newberry.

Sept. 5. Drive north from Newberry into swamp and back. Drive southwest to flowing wells south of Dollarville. (Notes on wells at Dollarville in Notebook 203, pp. 97-98). Springs southwest of asylum. Beaches north of asylum. Analysis of water by Dr. Nicholson.

Sept. 6. Drive to Millecoquin Lake from Newberry and back. Wells north of Engadine.

Sept. 7. Drive Newberry to Corinne. Notes from Mr. Carmichael on soils, timber, etc.; well at kilns at Corinne, 180 feet.

Sept. 8. Corinne to Gould City and Whitefish Lake and Germfask. Notes on flowing wells at Garden etc., collected from driller while at Germfask. Also records of wells at various points. Notes on soils, timber, etc.

Sept. 9. Germfask to McMillan via Helmer. Flowing wells.

NOTE: Transcription of notes in Notebook 203 for August 28, September 2 and 4 have been included with Notebook 204.

August 28, 1905. 7:00 a.m. Sault Ste. Marie.

Aneroid 29.595 at main depot = 615 feet. We take train on D.S.S. & A. Aneroid 29.555 at tannery in west part of Sault Ste. Marie at base of Nipissing bluff = 650 feet ±. Very stony land near Mile Post 3 and east from there but not west. Altitude 652 at this Mile Post = Nipissing shore. Sandy plain to Mile Post 4 = 659 feet; sand ridges west of Mile Post 4, altitude 663 to 670 feet. Ridges are 10 feet high around Mile Post 5 or to 673 or 675 feet. Mile Post 6, altitude 655, is in swamp south of sand ridges 10-15 feet higher 40 rods north or 665-670 feet.

Clay sets in near line Sections 31 and 32 and has only a thin coating west from there. Aneroid 29.525 at Mile Post 9 = 684 feet; 29.520 at east-west wagon road = 688. The sand ridges reach about 700 feet in this vicinity. Aneroid 29.550 at Mile Post 11 = 661 feet. The sand ridges are 5 feet or more higher or about 666 feet. Aneroid 29.545 at Brimley = 666 feet A.T.

About 1/4 mile west of a north-south road a rise is made into higher clay land, probably above Fort Brady beach, that runs 1½ miles south of Brimley. Aneroid 29.485 at town line 3 miles west of supposed beach = 720 feet.

Aneroid 29.480 at Mile Post 15 = 723 feet. About 1/4 mile west undulating land and boulders set in. Aneroid 29.470 at Mile Post 16 = 738 feet; 29.440 at Mile Post 17 = 761 feet. Boulders near this Mile Post. More or less clay down to within a mile of Wellsburg. Aneroid 29.380 where pine plains are entered at Mile Post 18 = 815 feet; 29.375 at Wellsburg = 825 feet; 29.360 at Mile Post 19 = 831 feet at 7:50 a.m.

Aneroid 29.360 at Mr. Raynard's at northeast corner Section 30, T.46N., R.3W., at 8:30 a.m. = 830 feet ±. Mr. Raynard says a bluff sets in about 2 miles north of Wellsburg that runs southwest, crossing the railroad 3

miles east of Rexford. Its base, by railroad survey, is 898 and top 923 on track. The top is perhaps 20 feet higher. It continues southwest. This is probably connected with the Algonquin beach or possibly the cut bluff next below the gravel beaches of the Algonquin. Aneroid 29.370 at Raynard's at 9:00 a.m. = 830 feet ±; 29.415 at ravine 100 rods southwest near center NE¼ Section 30 = 785 feet.

Mr. Raynard says the pine plains extend into west edge of Sections 30 and 31. The plains extend to northwest corner Section 31. The hardwood and mixed timber runs west along line of Townships 46 and 45 North, R.4W. about to middle of town line and the plains set in within 1/2 mile north, through north edge of Sections 36, 35 and 34. Farther north is jack pine, etc.

We come back to line Sections 31 and 32, T.46N., R.3W., about 120 rods from north end. Aneroid 29.400 at 9:30 a.m. = 800 feet. Timber is hemlock, birch and maple with some cedar in gullies. Aneroid 29.450 at Clear Creek near south end of line Sections 31 and 32 = 750 feet; 29.430 on plain south of creek = 770 feet.

The land is productive in Sections 28, 29, 30, 31, 32 and 33, but in Sections 5 and 6, T.45N., R.3W., there are sandy ridges that had pine. The sloughs between have spruce and tamarac.

Aneroid 29.470 at corner Sections 5, 6, 7 and 8, T.45N., R.3W., in a swamp = 730 feet; 29.475 at headwater of Waiska River on line Sections 7 and 8 at 10:30 a.m. = 725 feet; 29.460, 740 feet ±, on a sandy ridge at an old camp at middle of line Sections 7 and 8. This has whitewood, white birch and pine. The swamps have spruce, white cedar and tamarac.

We continue south 1/2 mile beyond the camp across the main Waiska (?) River--a larger stream than that north of the ridge. Mr. Raynard thinks it continues south of east to a swamp in Section 16. There is a large

marsh with clay bottom running northeast from Section 16 to Section 11 and the stream runs northeast to form the main Waiska River. There are no other ridges as large farther south, Mr. Raynard says, as the one the camp is on. It leads east-southeast through south part Sections 8 and 9 with the marsh south of it. It seems to bear west-northwest from the camp. It is 20-30 rods wide and 15 feet ± high and has a better class of timber than the other ridges to the north. They are 5-10 feet high and 6-10 rods wide and a lighter sand than this. If the moraine runs through this district westward this ridge is the only thing that seems at all likely to be its representative and it is an exceedingly faint affair. Aneroid 29.450 on the ridge at 11:45 a.m. = 740 feet.

We follow the ridge west 1/2-3/4 mile. It there seems to die out so we go north 6 rods ± to another ridge. The highest part of the ridge we followed is 20 feet above level of the camp or 35 feet above the bordering swamp but its general altitude is about 20 feet. The one we come onto north of the swamp is 10-15 feet high and only a few rods wide (10-12 rods). Aneroid 29.440 on crest at 12:30 p.m.

Aneroid 29.400 at Bolton's Camp at 1:45 p.m. = 760 feet; 29.350 at McBride's Camp in Section 36 (?), T.46N., R.4W., at 2:15 p.m. = 800 feet. There is considerable birch and hemlock with some maple on this section and west from here a couple of miles.

Aneroid 29.350 at Clear Creek near corner Sections 25, 26, 35 and 36, T.46N., R.4W., at 2:30 p.m. = 800 feet; 29.325 at edge of pine plains 1/4 mile north of creek = 820 feet; 29.380 at shore line 1/2 mile south of railroad track. This runs east-northeast and crosses railroad track near Mile Post 21 so has an altitude about 865 feet A.T., the altitude at Mile Post 21 being 863 feet. Aneroid 29.245 at beach at Mile Post 22 = 898 feet. This is on a slight terrace 10-15 feet above the flat 20 rods east but at

base of the main bluff. Aneroid 29.215 at top of bluff just west of Mile Post 22; 29.205 at top of cut at 22.5 Post about 12 feet above track or 935 feet A.T. This is a sandy ridge 10-15 feet above land each side and may be one of the Algonquin beaches. It seems quite as likely, however, to be a belt of dunes blown up from the shore east and south of it.

Aneroid 29.230 = 910 feet at Mile Post 23 on general level of plain back of this sandy ridge.

Aneroid 29.230 at Rexford Station at 4:30 p.m. = 923 feet A.T. There is a sand ridge running along the brow of the cut bluff from where I crossed 3 miles east of Rexford in a west-southwest course, passing about 1¼ miles south of the station. In places it is 25 feet or more above the plain on its northwest border. It seems very likely to be a dune belt rather than a lake level, the lake being under the bluff southeast of it at about 900 feet. I saw no boulders in the hardwood belt along and south of Clear Creek southeast and east of Rexford. The water is near surface and that makes the sand fertile.

The well at Rexford Station is 45 feet deep and just enters the water table a little. Sand entire depth.

At a target range 1¼ and ½ mile south of Rexford is a well 45 feet. Sand entire depth. There was a hardpan of brown color like iron rust struck at bottom of each well. (Information by Geo. Hand). Mr. Hand says the sand ridge that is 1¼ miles south of Rexford runs about a mile farther west and there fades out.

About 3 miles south of Rexford is a swamp and there are swamps and sand ridges for 8 miles south from there.

I take train west and pass some little lakes in basins near Mile Post 28, altitude 923 feet. At Mile Post 29 I am near the bluff, altitude 919 feet. There is a low bluff 1/4 mile or so east, rising to 933 feet, but the

main one is just west. Aneroid 29.250 on a swamp west 1/2 mile = 870 feet. There is a large sand ridge about half way between Mile Posts 30 and 31 running northwest to southeast across the track fully 25 feet high. There is a swamp east of it for nearly 1/2 mile and the land is all more or less swampy west past Strongs.

Strongs is but 1/4 mile east of Mile Post 32. Aneroid 29.280 at station = 840 feet; 29.310 at Mile Post 33 = 812 feet. Some clay ridges 30 feet high a few rods northwest of Mile Post 33, and clay land west from here--a reddish clay--for 1/2 mile or more; then sandy ridges 5-10 feet high near Mile Post 34.

Aneroid 29.360 at Eckerman at 5:20 p.m. = 800 feet.

THE FOLLOWING WELL DATA ARE FROM NOTEBOOK 203.

August 28, 1905, Eckerman.

Mr. G. Johneson, hotelkeeper, has a flowing well which he says is 35 feet deep but which Mr. Lake claims is at least 100 feet. There is some doubt as to who drilled it but Mr. Lake thinks Somerville of Newberry. Drilled in 1901. Flow is 10 quarts in 1-2/3 minutes. Diameter of pipe is 3 inches and water flows 4½ feet above ground. Temperature, 44.2 degrees. Discharge pipe 1/2-inch.

Mr. Lake, across the track, has a 50-foot well which flows 2 quarts a minute through a 2½-inch pipe. Temperature, 44.8 degrees. Driller--Mr. Lake, of Eckerman. Pipe leaks 1½ rods from pipe. Water bubbles up through sand. When water at Soo rose in the summer the water jutted up 5 inches or about through this sand spring. Temperature of spring in sand, 47 degrees. Well drilled in 1/2 day. Five feet sand, then 25 feet red clay to sand and gravel.

Up track 1/2 mile water flows out of hill from old steam shovel pit between clay and gravel. Lower ground at a distance of 100 yards on all

sides. To left of bridge 100 yards along river at distance of 50 yards mineral spring. Barrel sunk. Temperature, 44 degrees. This is east branch of this river. On main branch there are falls. Wire road to east and west road straight west to falls.

There are two flowing wells at Strongs, three miles east. One at shingle mill and one at a boarding house. (See later notes Notebook 204).

Flowing wells at Emerson on wire road:

1 back of mile
1 at front store
1 at barn
1 at cook camp
1 at hotel
1 at boom house 1 mile out.

F. Brissett, station agent at Eckerman, at his house, 50 yards from station, has dug well which he made himself, 35 feet deep, 15 feet of sand, then clay. Well flows but they have pump attached to pump into house. Temperature by pumping, 44.8 degrees. Rate of flow difficult to determine as it discharges through a leaky trough into a trench.

August 29, 1905. 6:30 a.m.

Aneroid 29.355 at Eckerman Station = 800 feet A.T.; 29.350 at 7:00 am. We go east on railroad track to a sand ridge 3/4 mile from Eckerman. Aneroid 29.310 = 835 feet A.T. It looks like a beach and has pebbles in the sand. The trend is west-northwest - east-southeast.

At the west bank of the East Branch of Tahquamenon River, north of railroad about 30 rods, is a sulphur spring with temperature 44 degrees F. Aneroid 29.350 at spring = 800 feet ±. Temperature of river at 7:30 a.m. = 52 degrees F. Beavers are now building a dam just above this spring and are putting in fresh cut brush.

Mile Post 34 is on river bank 25 feet below level of bridge. It is marked 807 feet on profile. This may be the natural surface.

About 1/4 mile east of river on north side of track is a good exposure of red clay. It contains scattered pebbles and an occasional boulder. Aneroid 29.270 on till ridge just west of Mile Post 33 and about 25 feet above track = 855 feet. This is a red till with boulders in it and on the surface and a few pebbles. This has hardwood timber with some maple.

There is a large tract of hardwood south of the river in Sections 25 and 26, T.46N., R.6W., and east from there in T.46N., R.5W. It runs west, passing south of Eckerman and coming up to the railroad a mile west of Eckerman. It is said to extend west to within 3 miles of Soo Junction and to be, in places, 4 miles wide.

Aneroid 29.315 at Mile Post 33 = 812 feet; 29.305 at small creek 1/2 mile west of Strong Station where railroad makes a curve = 820 feet A.T. Aneroid 29.250 at Strongs at 8:40 a.m. = 840 feet A.T. The Mile Post 40 rods west is on edge of swamp and is 829 feet. A sand ridge along east edge of swamp is the site of Strong Station and is probably an old lake level.

There is a well at mill that flows 1 quart a minute and has temperature 45.8 degrees. E. Turner, owner; made in 1899; depth, 185 feet. It was down to rock at 220 feet and then pulled back to 185 feet.

Another flow, at boarding house, is 203 feet ± deep. Made in 1899; temperature, 46 degrees; rate of flow about 2 gallons a minute. (See notes June 1912 on levels north from Strongs.)

Aneroid 29.230 at Strongs at 8:45 a.m. = 840 feet; 29.190 at camp 1 mile north at 9:00 a.m.; 29.210 at same place 15 minutes later = 860 feet ±.

I continue toward Salt Point in a north-northeast course through a level tract of hardwood with rich sandy loam soil carrying pebbles. The barometer is steady at 29.210 for fully a mile from the camp, or at altitude close to 900 feet A.T.

Aneroid 29.200 at forks of road 2⅓ miles from Strongs. We take the left-hand road = 907 feet; 29.115 a mile on this road where a road comes in from the southwest = 980 feet ±; 29.100 on ridge 1/2 mile farther = 995 feet; 29.160 at sag. The higher land keeps close by in the east and in about 1/2 mile the road turns north and rises into it. Aneroid 29.130 on what seems to be a beach line = 955 feet, trending north-south. Time, 10:40 a.m. About 60 rods north is a crest, aneroid 29.095 = 990 feet ±. About 20 rods farther is a higher one, aneroid 29.080 = 1,000 feet ±. The surface here is undulatory and I think it is likely to be above Lake Algonquin. West of the road 20 rods is a knoll where aneroid reads 29.060 = 1,020 feet. This seems to be the highest point in this region.

We take a road northwest from the south side of this ridge and find shore action well defined along the border, the aneroid reading 29.120 = 960 feet A.T. at upper limit of wave action.

The road leads across a narrow col between hills. Aneroid 29.120 in col. There is land to the west, as well as east, rising 25-50 feet above the Algonquin level, or to 1,000 feet. The road soon rises onto this western island. The pass or col seems to be 5 feet above the old shore level and 20-30 rods wide. After rising 1/2-3/4 mile west-northwest the road descends to the highest Algonquin shore, aneroid 29.115 = 960 feet ±. The land above this shore is very bouldery and greatly undulating.

Aneroid 29.180, 900 feet, at a lake near corners Sections 35 and 36, T.47N., and 1 and 2, T.46N., R.6W., at 11:30 a.m. The highest Algonquin shore turns south about 1/2 mile southeast of the southeast end of this lake.

We continue west along south side of lake through a very bouldery tract, rising to a summit near west end of lake, aneroid 29.130. Aneroid 29.185 at west end of lake at noon. The land north of the lake seems to

be 40-50 feet higher or 940-950 feet A.T. About 1/4 mile west of the west end of this lake we come to a well travelled road leading southwest which we follow, passing two lakes on the southeast side of the road that cover 80 acres or more each. They are at about the same level as the larger one, 900 feet ±. The land on northwest side of them, traversed by this road, is only 25-30 feet above the lakes as a rule, and has only a few boulders.

The aneroid is not lower than about 29.150 anywhere between the lakes and the Eckerman-Emerson stage road, or not above 880 feet A.T. Aneroid 29.150 at 1:00 p.m. = 870-880 feet where we come to the stage road. We go south along stage road and come to a cut bluff in about 1/2 mile, aneroid 29.170 at base = 840 feet ±. There is a hemlock and swampy tract north of this beach and also south. Maple and other hardwoods occur all along the other road that we travelled. We soon enter a cedar swamp and apparently make considerable descent on it. Aneroid 29.210 at a sand ridge, 800-810 feet, about a mile south of the cut bluff at 1:30 p.m.; 29.220 in swamp south of sand ridge. This level is held to the river 1/2 mile north of Eckerman--800 feet ±. Aneroid 29.225 at river at 2:30 p.m. = 775 feet A.T.; 29.195 at Eckerman at 2+45 p.m. = 800 feet; 29.150 at Eckerman at 4:15 p.m. = 800 feet.

We follow the track west to Mile Post 37, skirting the base of a till ridge timbered with maple until 1⅓ miles from Eckerman. The railroad then strikes into a cedar swamp and drops very rapidly to about 740 feet, beyond which it runs nearly level for several miles. The altitudes on list sent by Dr. Lane make769 feet at Mile Post 37 and 739 at Mile Post 38.

There are boiling or artesian springs along the track where it skirts the till ridge. One boils up with great strength on a summit about half-way between Mile Posts 36 and 37 and runs both ways in the ditch at side of track. It comes up through fine sand. The hillside back of it is

reddish till with boulders and pebbles.

I go back into the hardwood about a mile west of Eckerman to a shore line where aneroid reads 29.070, 850 feet ±, at 5:30 p.m. at base of cut bank; 29.055 at top = 860 feet. South from this there is very little rise so far as I can see. Aneroid 29.125 at foot of till ridge northeast of here; 29.145 at Mile Post 36 at 6:00 p.m.; 29.115 at Eckerman Station, 800 feet A.T. at 6:15 p.m. The till or red clay shows only on the slope of the ridge southwest of Eckerman, the top being sandy.

August 30, 1905, 6:00 a.m.

Aneroid 29.090 at Eckerman = 800 feet A.T.; 29.075 at 7:00 a.m. We take wagon road southeast from Eckerman, rising 40 feet in about a mile to edge of the hardwood timber through a cedar and spruce swamp, = 840 feet. Aneroid 29.000, 870 feet, where road turns south 1½ miles southeast of Eckerman; 28.990 on ridge 20-30 rods south = 880 feet. This does not seem to be a beach but rather an irregularity of the glacial material. Boulders are not rare.

Aneroid 28.960 at foot of a bluff 1/2 mile south that seems likely to be a shore line = 900 feet ±; 28.940 at top of bluff = 920 feet ±. This seems to be a knoll of only a few acres, for about 40 rods south we descend to level of north base. About 40 rods farther, a rise is made to nearly as high a level, aneroid 28.945 = 915 feet. This runs about 40 rods west and the road then drops down. This ridge runs east beyond our view but seems to run only a short distance west. Aneroid 28.955 on south side of it. Another rise to Aneroid 28.940, soon followed by descent to 28.960 on plain.

Aneroid 28.930 at south edge of hardwood tract 1½ miles ± from where we turned south = 930 feet; 28.940, 920 feet ±, at a mail box where road

turns east to Strongs, about 5 miles from Eckerman, at 8:20 a.m. We continue south. Aneroid 28.940 a mile south from the Strongs road = 920 feet ±. The surface is very flat for the next mile but seems to slope south. Aneroid 28.955 at south edge of plain 2 miles from the Strongs road at 8:47 a.m. = 900-910 feet; 28.980 at foot of slope = 885 feet; 29.000 at old camp on edge of clearings = 865 feet. The road has been in hardwood nearly all the way but the pine stump land has been nearby on the east part of the way. There are only a few boulders on this hardwood tract. Some show on the slopes but the high tracts are sandy.

We continue on foot south of the camp for over a mile through a plain with a gravelly sandy soil and much hemlock forest. It is dry ground and yet very level, therebeing no change that I can read on the barometer. I am told by men of Eckerman that this flat tract runs south to the railroad near Trout Lake with only a few sandy ridges on it.

Aneroid 29.015 at old camp at 9:50 a.m. where it read 29.000 about 9:00 a.m. = 865 feet; 28.955 at Strongs road 3 miles north of camps at 10:30 am where it read 28.940 at 8:20 a.m. = 920 feet.

We go east and leave the hardwood in about 1/4 mile. There is a rolling tract of pine stumps extending east and southeast as far as we can get a view. Small lakes are inclosed among the knolls.

We go northeastward to a railroad grade perhaps 2½ miles through pine stump land. We go north less than a mile along it to a hardwood belt. Aneroid 29.010 at edge of hardwood 1¼ miles south of Strong Station = 915 feet ±; 29.080 at foot of bank 1/2 mile south of Strongs = 850 feet ±; 29.100 at Tahquamenon River south of Strongs = 830 feet; 29.090 at Strongs at 11:30 a.m. = 840 feet. There is a strip of sandy land with low ridges along the river near Strongs on which there was pine, but the hardwood sets

in a short distance south. It does not extend more than a mile east of Strongs on south side of river.

The flowing well at Turner's mill is 220 feet. It was made in 1899, by Somerville; 2-inch pipe. It will rise fully 10 feet above the surface (see Somerville's statements later, p. 38). The one at Turner's boarding house is 203 feet; 2-inch; made in 1899. (Rock reported by Somerville at 220 feet, see p. 38). The water is piped from the boarding house to the mill so the measurement yesterday gives only a small part of the flow. (See Somerville's statements, p. 38)

Aneroid 29.090 at Strong Station at 12:50 p.m. = 840 feet. We drive southeast through the hardwood belt rising to about 895-900 feet on highest points. There are occasional boulders and a sandy loam soil. The altitude is fully 900 feet at edge of the pine stump land about 2 miles southeast of Strongs. Aneroid 29.010 on edge of stump land = 910 feet ±. This pine land is more stony than the hardwood. It has a gently undulating surface.

We go 2 or 3 miles through stump land and then enter jack pine plains near a lake with dunes on its west border in southwest part Section 35. Aneroid 29.010 on dunes; 29.020 on flats; 29.030 at lake. This covers about 10-15 acres.

There is another belt of stump land east of this lake for about a mile. We then enter jack pine land at the road which runs from Rexford to Alexander. Aneroid 29.030 on this road about 4 miles southwest of Rexford at 2:50 p.m.

About 1/4 mile south of here and 1/4 mile east is a shore line trending northeast-southwest. Aneroid 29.025 on crest of beach at 3:00 p.m. = 925 feet; 29.025 at Rexford = 923 feet at 4:10 p.m. This road to Rexford leads through a jack pine tract with sandy gravel and a few boulders and cobblestones. There was one lake 1/2 mile southwest of the

target grounds in a shallow basin. There are low dunes around it. The target grounds are 1 mile west and 1/2 mile south of Rexford.

We drive northwest 4 miles to the hardwood through undulating stump land that seems to be about the same altitude as Rexford on the higher points. The hardwood is scarcely as high as the stump land, the conditions being similar to what we found southeast of Strongs. Aneroid 29.070 at edge of hardwood at 5:30 p.m. = 920 feet.

Aneroid 29.110 at Dollar Settlement road, 880 feet. We drive east 1/2 mile making a descent of 20 feet perhaps over a shore line, 830 feet, though it is not clear that it is one. We turn about and drive west. About 1/2 mile west we come to a cut bank, aneroid 29.070 at base = 920 feet; 29.040 at top = 950 feet. There is high land to the south 15-20 feet higher. We soon rise to where aneroid reads 29.000 or 980 feet A.T. Aneroid 29.100 where we go into camp 5 miles northeast of Strongs = 890 feet.

August 31, 1905, 4:45 a.m.

Aneroid 29.235 at camp = 890 feet. We continue west and within a mill cross parts about 905 feet. Aneroid 29.170 on three consecutive high points = 965 feet ±; 29.185 at intersection with the Salt Point road about 1¼ miles west from where we camped = 950 feet ±. In about 1½ miles south we descend to a plain where aneroid reads 29.280 = 900-910 feet. This is about 1/2 mile north of an old camp and probably 3 miles from Strongs. Aneroid 29.290 at road intersection = 900 feet, 2 miles north of Strongs where we turned northwest August 29. Time, 6:00 a.m. Aneroid 29.370 at Strong Station at 6:45 a.m. = 840 feet; 29.385 at Strong Station at 7:40 a.m.

A well at Hackley Phelps and Bonnell mill 1 mile north of Strongs is

63 feet deep and has very little rise. Aneroid 29.320 at well = 860 feet; 29.310 at road intersection 2 miles north of Strongs at 8:30 a.m. where it read 29.290 at 6:00 a.m. = 900 feet.

We follow same road northwest that we took August 29. Aneroid 29.330 at col at 10:10 a.m. that I took then to be the height of highest shore line = 920 feet ±; 29.290 = 940 feet at highest point on road; 29.400 at level of lake near town corner = 840 feet ±; 29.370 = 875 feet at road to Nelson's camp at noon. I go northeast along road toward the camp about a mile to a fork in the road crossing what appears to be a shore line (gravelly ridge where aneroid reads 29.350 = 880 feet). This seems to run around on the north side of the lake. Aneroid 29.380 at forks of road north of this shore line = 850 feet. Boulders are rather numerous on this lower land as well as on the high land southeast and south of the lake. I return to place where we stopped at noon. Aneroid 29.385 at 1:00 p.m. = 875 feet.

We go west to the stage line road 5 miles north of Eckerman. Aneroid 29.380 at 1:40 p.m. = 880 feet ±. This is on a plain that extends most of the way to the lakes east of here 2 miles. We turn north and enter a stony, gently undulating tract on which the highest points are scarcely 20 feet above the plain to the south. About 2 miles north from where we struck this road the aneroid reads 29.300 and this seems to be the summit on this road, 915-920 feet. There are low ridges of yellowish sand on this high part but not well defined beaches. There are small boulders.

About 2 miles farther, or at an east-west road, the altitude again gets high, the aneroid reading 29.500 at this road at 3:00 p.m. = 915-920 feet. The surface here is flatter than on the other high tract. The road that runs east here leads to the falls of Tahquamenon River. The undulating land appears within the next mile north. There is then a flat tract 1/2 mile ± with considerable hemlock, at the north edge of which is a bluff.

Aneroid 29.360 on brow of bluff, 860 feet ±; 29.380 at base = 840 feet ±. About 60-80 rods farther north another drop is made. Aneroid 29.440 at base of steep slope = 780 feet--a gradual descent north from this. Roads lead off both east and west from here. About 60 rods farther north is another drop, aneroid 29.460 at top of bluff; 29.475 at base = 740 feet ±.

Aneroid 29.490 at an old camp that is about 4½ miles from Emerson, 720 feet; 29.510 at foot of low bluff 40 rods north of old camp = 720 feet. North from here is a swamp and red clay sets in near a small stream 1/4 mile or more out in the swamp at 675 feet ±. The drift south from here has all been sandy or a sandy loam as far as Eckerman where red clay again shows. Aneroid 29.560 at dwelling in Section 32, T.48N., R.6W., = 650 feet. About 1/3 mile north of here is a sandy ridge of same elevation as the clay south but higher than the tract north. Aneroid 29.580, 650 feet, on cedar swamp north of sandy ridge; 29.600 at stream flowing east near corners Sections 28, 29, 32 and 33, T.48N., R.6W., = 630 feet. There is sandy soil from this main creek northeast. This is within 30-40 feet of lake level, or 630 feet ±.

There are several flowing wells at Emerson on ground scarcely 5 feet above lake level. One in front of Emerson Transient House has a flow of 1 quart in 80 seconds but leaks around pipe a little so full flow is about 1 quart a minute. Driven 1/4-inch with a 5/16-inch reducer. Made in (?) by Mr. Somerville. Temperature, 44 degrees. Well is enclosed.

One in front of post office flows 1 quart in 35 seconds. Temperature, 45 degrees F. Well is out on street and exposed to sun heat.

The first well made was at the cook house about 15 years ago. It had 17 feet of sand, then 92 feet of blue clay, then sand and gravel 8 feet. Head is about 4 feet above ordinary lake level. Diameter of pipe, 1¼ inches. A 5-inch casing is first driven and then 1¼-inch pipe inserted as they keep

cleared of sand better than the 5-inch. The sand is first extracted from the large pipe and the small one then inserted. The wells made since differ but little in depth. The range in depth is from 116 to 123 feet. There is 17 feet of sand in all of them and below this, clay. The clay is struck in bed of Whitefish Bay at about same depth of water. (See Notebook 203, pp. 96-97 for notes on these wells by G. L. Tower.)

September 1, 1905, 6:00 a.m.

Aneroid 29.610 at Emerson, Michigan. We go north to flowing well at the log boom on river. It is 116 feet, has flow of 1 quart a minute, and temperature 47 degrees F. This is on bank of the Tahquamenon River. The river has 7-12 feet of water here. The tide from the lake gets back up the river halfway to the lower falls so that logs drift upstream as well as downstream. The well is less than 2 feet above lake level. The bank of the river just west of here is 4 feet.

In Section 16 east part, it is 38 or 9 feet. In northwest part Section 17 the bank is 16 or 17 feet. Aneroid 29.650 at river in Section 24, T.48N., R.7W. = 602 feet A.T. We take a skiff here and row up the river. There is some higher land in south part Section 24 than that we have been traversing and it may rise above the level of the Nipissing beach. The tamarac timber only extends 2 miles back from shore of Whitefish Bay. There is then a change through spruce, birch, and hemlock to maple forest in this higher land in Sections 24 and 23.

There is said, by residents of Emerson, to be very little hardwood north of the Tahquamenon River below Little Falls or Lower Falls. There is Norway pine on a sandy country from the river north to Whitefish Point. The hardwood belt about 8 miles wide runs west across the river south of Lower Falls and continues west across Luce County, keeping north of a great swamp that the West Branch of the Tahquamenon traverses. The swamp is 5

miles or more in average width. The hardwood runs out points into it in places. The country north of this hardwood belt is largely sand in northeastern Luce County as in northwestern Chippewa, but farther west is a hardwood belt near the shore of Lake Superior.

We come to clay banks in Section 15, southwest corner, at an old camp. Aneroid 29.670 at river level, 602 feet. The red clay is laminated and has an occasional pebble. Aneroid 29.590 = 675 feet at top of bank. There is a gradual rise back from the river for some distance. The clearing extends 1/4 mile and timber indicates a rise still farther back. I am told that the land soon gets sandy on passing back from the river but there is a clay soil up to 675 feet A.T. There is a cut bank below this, the base of which is about 645 feet A.T. Can this be the Nipissing? It seems rather low.

Across the river from here is a hemlock forest but on south side where we landed there is maple and other hardwoods. There is a high bank at edge of river in northeast part of Section 4 (east bank) where aneroid reads 730 feet altitude. There is red clay for only 10-20 feet. Above this is sand with scarcely a pebble in it. The upland to the east from here is undulating with swells 10-25 feet above sags. The above reading was on a swell. Near where we turn north in Section 32, boulders and cobblestones appear to 3 or 4 feet above river level and an occasional sandstone block. The river soon becomes very shallow with a bottom of loose stones. The uplands are about 700 feet. There is hardwood northwest of the falls, but Norway pine east and north. There is a clay up to within 30-40 feet of top or 80 feet above Lake Superior -- a reddish clay. This is capped by sand. Water is struck in a well here at the camp at about 15 feet. The clay seems to be that near the surface in sags. The sand is not pebbly so far as I have yet seen. I think the ridges are wind drifted.

We go to the Lower Falls of the Tahquamenon about the sharp bend in Section 32. There is an island in the river and a dam across the west channel, so nearly all the water goes over the east channel. There are several cascades of 3-6 feet and the main fall is about 17 feet. The total fall on the rapids and cascades connected with the lower falls is said to be 45 feet. The upper fall is 5 miles above and is said to be 40 feet in a single plunge. There is a very short rapids above the upper fall and there is a low sandstone cliff on west side for a short distance above the upper fall about 20 feet high.

The hardwood belt has its north border on a line running from the Lower Falls northwest to south end of Betsy Lake in Sections 18 and 19, T.49N., R.7W., and along west side of the lake. Con Culnane & Son railroad now owned by Harry Parks. Aneroid 29.495 at place where I take the railroad in north part Section 29 about 80 rods from northeast corner = 715 feet at 4:15 p.m.; 29.460 in Section 35 west of old camp; 29.470 at a sand ridge in west part Section 26. This is a ridge several miles long, running into Section 36. We pass from here into Section 23. Aneroid 29.470 at south side of a spruce swamp, with jack pine in north part. It is in Sections 26 and 23. Aneroid 29.500 at south branch of Shelldrake River 1/4 mile west of an old camp in Section 13; 29.465 at camp (abandoned) 1 mile farther north in Section 12; 29.520 at foot of bluff west of Shelldrake River = 655-660 feet = Nipissing beach; 29.540 at river bridge; 29.575 at the terminus of road in Shelldrake at 5:50 p.m.

Mr. Calhoun made a boring about 3 years ago at Shelldrake, 200 feet, that has a head--60 feet. It was at about Lake Superior level at well mouth.

A well in a swamp in Section 28, T.49N., R.7W., only 16 feet deep

overflowed and ran out a pump 3-4 feet above surface.

The driven wells in Shelldrake range from 10 feet up to 85 feet. The deeper ones strike gravel, but the shallow are entirely sand. There is no clay here near surface. There is considerable bog iron here.

I am told by Mr. Harry Parks, at Shelldrake, that a prominent belt of dunes runs along the shore of Lake Superior west from Whitefish Point that prevent Shelldrake River from going into the lake and turn it east. They are much higher than the tableland I was on west of Shelldrake. He estimates the altitude at fully 200 feet above Lake Superior near Vermillion. The crest is generally 1/2 mile to a mile back from the shore. The beach can be driven with horse and buggy from near Deer Park eastwards to Whitefish Point. There are lifesaving stations about once in 10 miles and mail is carried along the beach from Whitefish Point to these stations. Whitefish Point is not high. It is in plain view from Shelldrake. The high land sets in 3 or 4 miles west of the Point. There is a high tract with hardwood timber on it about 6 miles north-northwest of Shelldrake that is said to be sand. It has swampy land around it. It covers 1 or 2 square miles. There is a large amount of cranberry marsh on Whitefish Point. The Nipissing shore is likely to be at least halfway from the present Whitefish Point back to the bend of the Shelldrake River. The high point noted above may mark the extreme Nipissing point between the bog and the lake. The village of Shelldrake is on a beach about 5 feet above lake level with a swamp back of it through which the river runs southward.

September 2, 1905, 6:00 a.m.

Aneroid 29.500 at level of Lake Superior at Shelldrake. I follow the shore south along the low beach (4-6 feet above lake level) on which

Shelldrake is built.

I am told by Mr. Bradley in south part Section 15 that a bluff sets in about 3/4 mile back from the shore in this section and on this is Norway pine. This seems to be the Nipissing bluff. It runs northward to mouth of south branch of Shelldrake River and up the main river about to the corner of Sections 20, 21, 28 and 29. Above there the river is in a low marshy tract that was probably covered by Lake Nipissing. The bend in Sections 21 and 28 is apparently around a point that marks the turn from Whitefish Bay to the lake in the Nipissing stage. There is, however, high land in Section 22 and bordering parts of Sections 14, 15, 23 and 28 with Norway pine on it that may be above Lake Nipissing level.

The bluff from Section 15, T.49N., R.6W., runs toward the shore of Whitefish Bay and is said to have a swamp back of it in south part T.49N., R.6W., so it is probably a bar. The swampy land extends to the Tahquamenon River. The highest land is in Section 27 (at edge of lake) and is about 30 feet above lake level. There are small pebbles 1/2-inch or less in diameter in the sand nearly to top so it is not wind drifted. It seems a little too high for the Algoma Mills beach unless that rises northward to more than 620 feet A.T. This has hemlock and birch with a little Norway pine at the shore but changes to a Norway forest a short distance back. The hardwood strip in northeastern Luce County runs from Section 12, T.50N., R.8W., south-southwest toward Section 9, T.49N., R.8W.

Mr. F. B. Cheesbrough states that the barometric changes cause about 18 inches difference in level at Emerson. The water will go up and down in an hour's time several inches when there is no wind to raise the waves. This most is marked before a heavy storm. There was such a fluctuation on August 29, amounting to about 18 inches. It is mostly a rise above the

ordinary stage of water. This causes the logs to go up the river and tears rafts to pieces.

I take stage from Emerson to Eckerman. The small creek near corner Sections 28, 29, 32 and 33 is about 630 feet instead of 610 feet. The old camp near the town line is 720 feet ±. The highest points in the hardwood timber are 915-925 feet A.T. Boulders are conspicuous above 800 feet A.T., but not much below. The road intersection 5 miles north of Eckerman is about 880 feet and the beach at base of cut bank 4 miles north of Eckerman is about 840 feet. The high points along or near the line of Townships 46 and 47 North, R.5W., look, when viewed from Emerson, to be fully 100 feet above the country through which this stage road runs. One of the highest is southwest of the lake in Section 32, T.47N., R.5W. Probably another was crossed on the Dollar Settlement road where the aneroid (August 30 notes) indicated 965 feet A.T. It is possible that some points on this high tract reach 1,000 feet A.T. The Algonquin beach is likely to lie a little below their summits. Possibly the highest beach noted on Dollar Settlement road August 30 is the highest Algonquin, at 920 feet ±. We may also have reached the highest Algonquin northwest of Strongs near the township corners. Strongs Station is in southwest part of Section 20, or 3½ miles west of the point indicated on the map.

I am told that the belt of high rolling hardwood country that passes south of Eckerman surrounds the lake in Sections land 2, T.45N., R.7W. Its south border is 1½-2 miles northeast of Hendrie, and it runs northwest from there to within a mile or so of the railroad east of Soo Junction. A cedar swamp 1½ miles ± wide lies east of the railroad from Hendrie to Soo Junction.

I take evening train to Newberry, but it is dark before leaving Eckerman.

THE FOLLOWING WELL DATA ARE FROM NOTEBOOK 203:

September 2, 1905.

Flowing wells visited at Emerson. Well at saw mill is situated on lakeside opposite town and pipe comes up through lake water, hence temperature is somewhat altered. Temperature, 49 degrees. Rate of flow, six quarts a minute. Water flows through 1¼-inch pipe to a distance of 1½ feet above dock. Dock is 4 feet above lake level. Discharge pipe is 3/8-inch.

Well in front of cook shanty 200 yards north of mill: Temperature, 47½ degrees; rate of flow, 2½ quarts a minute to 2½ feet above ground through a 1¼-inch pipe. Discharge pipe, 3/8-inch.

Well in rear of cook shanty: Temperature 47½ degrees; rate of flow, 1 gallon in one minute through 1¼-inch pipe; discharge pipe, 3/8-inch to distance of 1½ feet above ground.

Well at house just south of mill: Rate of flow is about 1 pint per minute and temperature is difficult to determine on this account. Pipe is 1¼ inches to 1½ feet above ground and discharge pipe is 3/8-inch.

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September 3, 1905, Sunday.

Newberry, Michigan. Waterworks plant installed in 1900. Three 6-inch wells 110 feet deep, head 10 feet. Entirely sand to a gravel at about 90 feet. Direct pressure--Smith-Vaille pumps. About 3 miles of mains: 8-inch about 1/2 mile; about 2 miles of 6-inch, and balance 4-inch. About 135 taps 1/2-inch and 3/4-inch. Ordinary pressure, 60 pounds; fire, 100 pounds. Pumps 14 x 7 x 12 duplex. Supply is unlimited.

September 4, 1905.

Mr. James Somerville, a driller at Newberry, made well at Johnson's Hotel in Eckerman, 47 feet. The clay is 40 feet; gravel 7 feet. Made about 1896. First flow was at rate of about 2 gallons a minute from 3-inch pipe. The other two wells, Brizetts and Lakes, are 35 feet each.

The mill well at Strongs was first sunk 185 feet and got a flow. The pipe was pulled. Afterward a hole was driven to rock at 220 feet but pulled back to 185 feet.

The boarding house well is 203 feet. The sand is 7 feet. The red clay under this changes to blue and extends to 175 feet. Very few stones in it. There was a gravelly hardpan from 175 to 185 feet. Under this was a quicksand to a hard crust at bottom, under which the water is found that flows.

The well a mile north of Strongs at the Hackley mill is 62 feet and has very little rise of water. It was through gravelly sand all the way.

The well at the old camp on south bank of Tahquamenon River in Section 15, T.46N., R.7W., is 90 feet deep, or to 15 feet below river level. There was no rise of water.

Mr. Somerville made several borings on the asylum grounds south of Newberry 186 feet. It is sand all the way down. There is a hardpan at 4-5 feet that holds the moisture near surface. Water is struck at 119 feet. There is no rise of water. The wells are three 6-inch and one 8-inch. Recently, 1898 or 1899, a deeper well was drilled that struck limestone at 320 feet. The well is 457 feet, as stated by engineer of asylum waterworks, Mr. Brown. Diameter of pipe, 7½-inch. Will yield easily 200 gallons a minute by pumping. Head, -104 feet. The lower 70 feet is shaley material. Water is from upper 6 feet of limestone. All higher water cased out. Altitude at well about 900 feet.

A well for the furnace company one mile south of asylum was sunk 100 feet through sand and has no rise.

Another, 2½ miles farther south and a little east is 70 feet. The character of sand determines the depth to go.

A well for Murphy and Gorman, 2 miles east and 1/2 mile south of the asylum, is 180 feet. It struck water at 110 feet in a fine sand too fine to filter. This passed through a blue hardpan at 160-167 feet. The rest was sand.

Another well for Mr. Stewart, 1/2 mile south and a mile east from the Murphy and Gorman well, is 67 feet and was entirely sand with no rise of water. The land is lower than at the Murphy and Gorman well.

Two wells 1/2 mile south of the Murphy and Gorman well are 100 feet. Another, 3/4 mile west of these two wells, for Mr. Stevenson, is 137 feet.

A well for the asylum woodcamp about 1/4 mile west of the Murphy and Gorman struck the blue hardpan at 100 to 165 feet. Water in sand under the hardpan and also on top of the hardpan.

There are 4 flowing wells at Dollarville, one of which is out of use because too strong in sulphur. They all belong to the Cornelius Danaber Lumber Company. One is 140 feet; another 120 feet, and one 130 feet. The sulphur one was about 120 feet. The sulphur one was sunk in 1883. Two others were sunk nearly as long ago. The 140-foot one was sunk in 1883 and the 130-foot in 1884. One at the boarding house now has a pump attached. Limestone rock is struck there at about 130 to 140 feet. Altitude of wells, 725 feet. It is a black hardstone. There is a few feet of sand and below this is clay down to about 50 feet. Below this is a hardpan gravel.

A well made in 1905 at a mill a mile north of the depot in Newberry is 155 feet to water. It struck soapstone at 151 feet. It was through variable beds of clay, gravel, sand, etc., in beds a few feet each. The

head is 6 feet above surface. A charge of dynamite was put in and this burst the pipe and no water now comes out. The first flow is from 24 to 28 feet depth. The main flow is from the bottom.

The flows along the railroad in Newberry have been lowered so that water is now hardly level with the surface. The principal supply is from 70 to 80 feet at the furnace. The private wells are from 35 feet up to 75 or 80 feet that used to flow.

A well on the Tahquamenon River north of Soo Junction is 172 feet and overflows. It is a 3-inch well. Made about 1893. Head, 8 feet above surface. It is on White and Francy Mill property. It is 1/2 mile north of river. It was largely a putty clay. There was 3 feet of gravel at bottom that rests on rock.

There is a flowing well a mile east of Newberry on Ryburg land, 170 feet deep, that has head 8-9 feet above the surface. Made by Somerville about 1897. There was a large amount of clay 80 to 100 feet and below this is gravel and quicksand. There is about 4½ feet of black muck above the clay. This has 3-inch pipe. Top of pipe 3½ feet above surface. Flow, 1½ quarts a minute 3½ feet above surface. Temperature, 45 degrees F.

One flowing well at the section house 3/4 mile east of Newberry is 54 feet and it passed through 40 feet of hard red clay, below which was sand with water and gravel at bottom. Well made in 1889. Well has 1¼-inch pipe in 3-inch hole. Temperature by pumping, 45 degrees F.

A well at the Harris celery garden just east of Newberry did flow but has stopped. It is 60 feet; 1¼-inch pipe in 3-inch hole.

The Emerson wells at Emerson range from 115 to 140 feet. There is a red hardpan below the water vein. The owner of wells, Mr. Cheesebrough, says the range is from 116 to 123 feet.

At Shelldrake a boring was put down 250 feet. It entered the red clay

at about 5 feet and considerable clay, there being only thin beds of sand. It terminates in the red clay.

The engineer of waterworks at asylum gave data that I have inserted on page 39 in reference to the deep boring. He says a hardpan occurred at about 240 feet under which there was a waterbearing gravel. There is a well 245 feet deep at the asylum which uses this water. Temperature of water is 46 degrees F.

We go up to the asylum and find the altitude to be about 890 feet A.T. A knoll on town line near west end of line Sections 1 and 36 is 895 feet by aneroid; about 906 feet by level. A small lake in south part of SW¼ Section 35 is 730 feet A.T. It is called Hamilton's Lake. There is a recess in the moraine west from the asylum one mile that extends the swamp southward into Sections 11 and 10. The west part of Section 1 and all of Sections 2 and 3 are swampy.

Aneroid 29.270 at Newberry Station = 765 feet; 29.265 at section house = 770 feet, where there was a flowing well. A pump is now attached so it stops the flow. It is south of railroad track. The well at the Ryburg place is north of track and is about 760 feet A.T. It will discharge 1½ quarts a minute 3½ feet above surface (see p. 43 of notebook). Aneroid 29.270 at road 1 mile east of Newberry running south from railroad = 765 feet.

On the road south from Newberry I took following readings: Aneroid 29.275 = 765 feet at Newberry Station; 29.235 = 800 feet at corner Sections 25, 26, 35 and 36 on a plain. There is a ridge 80 rods west that runs south from the court house in southwest part of Newberry and after crossing into Section 35 turns east, crossing line of Sections 35 and 36 about 40 rods south of the corner. Aneroid 29.230 at base = 805 feet. This may be

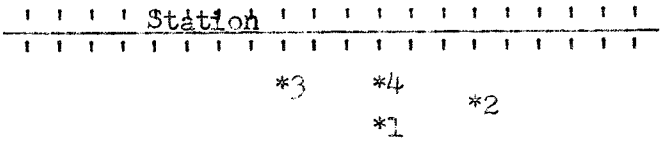
a shore line. It is about 8-10 feet high here. South of it is a plain rising gradually southward for about 1/2 mile to where aneroid reads 29.190 then a more rapid ascent begins to what looks to be a beach at about 860 feet, aneroid 29.175. It is a low ridge at base of the steep slope. There is sandy surface. Back of this 20 rods ± to the south is the base of a steep cut bluff. Aneroid 29.160 at base = 874 feet by level; 29.130 at top = 898 feet by level in 1912. There is a large amount of cobble and gravel here with limestone cobble and slabs as well as Canadian rocks.

The uplands south of here are gravelly in places, but usually have a sandy soil. The uplands are strewn with boulders and so are the flat tracts north as far as the swamp, on or near the railroad. They rest on clear sand with scarcely a pebble in it in some places. Possibly they have been dropped on this plain by ice along the shore of the old lake. The sand extends to the edge of the swamp. There, a change sets in to muck, marl and clay with some sand interbedded. The muck runs up to about the level of Newberry Station, or perhaps 5-10 feet higher, and there is a little bank usually along its edge. I am told that on north side of the railroad near the section house 3/4 mile east of the station a bed of marl 6 feet thick was found under 5 or 6 feet of peaty muck. Wells near it get water in sand under a hardpan crust at about 35 feet but the section house well is 54 feet as noted by Mr. Somerville. Clay seems to be present on the plains each side of the projecting point of a moraine that runs east-west, south of this railroad line. It may be merely a local deposit. The wells are not widely enough distributed to test the matter.

THE FOLLOWING WELL DATA ARE FROM NOTEBOOK 203:

September 4, 1905.

Wells at Dollarville. Wells here belong to the Cornelius Danaber Company.



1. Two hundred yards from station and 50 yards from track in direction of Newberry. Temperature, 45 degrees; rate of flow, 10 gallons a minute. Built 18 years ago and used to flow strong enough to dash a bucket from the hand. Three-inch pipe to 4 feet above ground, and discharge pipe of one-inch. Slight iron taste. People think it is 95 feet deep but not certain. Water from this well is piped to livery barn 300 yards distant.

2. Well 500 yards in same direction from station. Three-inch pipe to 1½ feet above ground and discharge pipe one-inch. Temperature, 46 degrees. Rate of flow, 3 quarts a minute. Strong iron taste which discolors boards underneath.

3. There is a well 50 yards from depot which comes quite near the surface but does not flow. Pump attached.

4. There used to be one in front of the saloon 200 yards from station east but the water had a sulphur taste and its use was discontinued. Well is now plugged up.

Fourteen miles south of Dollarville there is a very large flow. Hunters, 5 miles out, has another. Go 3 miles south and 1 mile west. Peterson: Go 2 miles south and 1½ mile east. Carson, next place west, also has one. The best road to these is through Dollarville, but road past asylum may be taken.

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September 5, 1905, 7:15 am

Newberry, Michigan. Aneroid 29.330 at station = 765 feet. We drive north across the swamp. Aneroid 29.380 at Tahquamenon River = 720 feet. There is red clay on river bank. The bank is about 8 feet high, so river is about 712 feet here. For notes on well here see p. 41 of notebook. Rock surface here is about 570 feet. The swamp has sand at surface back from the bank of river a short distance. There is cedar, tamarack and spruce and birch in the swamp.

Aneroid 29.330 where a road leads west about 2⅔ miles north of Newberry at north edge of swamp, = 760 feet; 29.325 at first house north of the swamp on edge of hemlock forest. Boulders set in here on a sandy soil like that at Newberry. Aneroid 29.310 at south edge of moraine 1/2 mile south of schoolhouse. There is red clay in it in low knolls. The maple timber sets in just south of this undulating moraine. Boulders are numerous. Aneroid 29.295, 800 feet, at schoolhouse at 8:10 a.m. This is probably in northeast corner Section 2. Red clay seems to be very near the surface but soil is sandy.

The main road runs west from the schoolhouse but we continue north to a stream, aneroid 29.610. We here have the buggy and go north to middle of line Sections 23 and 24. Aneroid 29.310 at base of sand ridge; 29.285 at top of ridge. We follow this eastward across the town line past a beaver meadow. The beavers have recently gnawed off trees 6 inches in diameter here and cut them into cordwood lengths. There is a large beaver dwelling 5 feet high and 8-10 feet in diameter built of brush and peaty material standing in the deepest part of the water in the meadow. The dam is 8-10 feet wide and stands about 2 feet above present water level. Aneroid 29.330 at beaver meadow near line Sections 24 and 19 at 9:50 a.m.

There is no high land for 3 or 4 miles north from here. The land is marshy with low sand ridges. The high land noted yesterday from the asylum must be in the next township north.

We return to the house at the creek on line Sections 25 and 26. Aneroid 29.320 at 10:30 a.m.; 29.315 at schoolhouse in northeast part of Section 2; 29.315 at schoolhouse at 10:45 a.m. = 800 feet where it read 29.295 at 8:10 a.m. = 800 feet. This is in northeast corner Section 2. Aneroid 29.340 in cedar swamp at section corners 1 mile south of schoolhouse = 765 feet. South of this for ¼-⅓ mile is drier land with hemlock timber

and sandy soil with boulders scattered over it. Aneroid 29.330 on the highest points = 775 feet; 29.350 in swamp at south edge where a travelled road runs west = 755 feet. There is also a road at north edge of hemlock tract leading west but probably a winter road.

Aneroid 29.405 at Tahquamenon River at 11:10 a.m. = 710 feet A.T. There are sand ridges each side of the river running parallel with it in a belt 1/2 mile ± wide each side of the stream. Those farthest from the stream are 25-30 feet above it but are only 10-15 feet high.

Aneroid 29.345 at Newberry at 11:20 a.m. = 765 feet; 29.370 at Newberry at 1:00 p.m. = 765 feet; 29.330 at court house; 29.410 at Dollarville Station = 725 feet at 1:45 p.m. The flowing well piped to a barn south of station is very strong in iron, but I do not taste sulphur. The others are similar. Mr. Tower's statistics are in Notebook 203.

I drive south from Dollarville across a swamp in which there are low sandy ridges. It is largely tamarac and huckleberry. Much of the tamarac is dead. The east border lies 1/2-3/4 mile east of the road for nearly a mile south of Dollarville. It then recedes to the east into Section 2, as noted last night.

Aneroid 29.410 at stream 1 mile south of Dollarville; 29.405 at south edge of marsh = 730 feet about 30 rods from south end of line Sections 3 and 4 at 2:15 p.m.; 29.370 at section corners 3, 4, 9 and 10 = 760 feet.

James Watson, in southeast corner Section 4, has a well 106 feet deep. There is some hardpan and clay near top. Quicksand is struck at about 20 feet and runs to the gravel at bottom. The head is -26 feet.

The schoolhouse well, in east part of Section 9, is 192 feet and head is -135 feet. It was largely through sand.

Andrew Carleson, in north part of NW¼ Section 10, has a well 150 feet deep on ground about 850 feet A.T. The head is very low so that water is

hard to pump. The schoolhouse is also 850 feet A.T. Aneroid 29.275 at well at 2:30 p.m.

There is a cut bluff in a knoll 40-60 rods east of schoolhouse in the west part of Section 10. Aneroid 29.270 = 860 feet ± at base; 29.240 = 885 feet at top.

John Templeton's well, across road from schoolhouse, is 196 feet deep. The head is about 100 feet below surface.

I find that the knoll east of schoolhouse is only 25-30 rods long and about 10-15 rods wide. There is a beach or cut bank south of it, aneroid 29.280 = 850 feet A.T., that crosses the quarter line road in a west-southwest - east-northeast course about 60 rods from west end. I go west across Section 9 and leave the sand and enter a clayey tract a little east of the center. Aneroid 29.350 at top of clay = 780 feet. It is a reddish color and carries a few pebbles.

A little west of center of Section 9 on north side of road is a flowing well running a quart in 35 seconds. Aneroid 29.390 at well = 740 feet ± A.T. Temperature, 45 degrees F. This is by a place where house is burned. I find that a large part of the flow runs out underground into the road so the part running from pipe is probably less than 1/4 the full flow. The well belongs to John Hunter of Newberry. It is 103 feet. (See Carleson, the village marshall.)

A. Pentland, in SW¼ Section 10, has a flowing well 103 feet deep, 1½-inch. Made in 1899 by James Somerville. Water will rise only 1½ feet above surface. Aneroid 29.400 at well. It was largely through red clay--90 feet. It flows a quart in 25 seconds. Temperature, 46½ degrees. There was sand at 90 feet.

Aneroid 29.285 at schoolhouse in Section 9, 850 feet, at 4:15 p.m. John Peterson, in NW¼ NW¼ Section 11, has a flow. The depth is 53 feet.

Mainly red clay. Made about 1901 by Mr. Peterson. Flow, 1 gallon a minute. Temperature 45 degrees F; 2-inch pipe.

John Swanson, in southwest part Section 2, has a flow, about 84 feet. Flows 3 quarts a minute. Temperature, 45 degrees F. Nearly all sand. (See p. 55 of notebook).

Aneroid 29.375 at Watsons Corner, southeast corner Section 4 = 760; 29.340 at a beach line 80 rods east = 790 feet.

Aneroid 29.300, 830 feet, at Andrew Carlson's well in north part northwest of Section 10. Well is 150 feet. Water was struck at 75 feet and that is the level of water in the well. Well was made in 1900 by Peter Brouessau (now dead).

Aneroid 29.270, 860 feet, at another shore near middle of line Sections 3 and 10. This is around the base of a knoll with a basin in it. Aneroid 29.245 at highest part of knoll = 835 feet. The knoll only covers 1½-2 acres. There is a deep hole like a sink hole in north side of this knoll below the plain that is wave cut. Perhaps there is limestone under it. There are slabs or large blocks of limestone scattered over the surface here as well as numerous boulders.

Aneroid 29.410 at creek near corner Sections 2, 3, 10 and 11 = 730 feet. Peterson's well is 30 rods east and 8-10 feet above creek level, 740 feet ±. Rate of flow is 1 gallon a minute. Temperature, 45 degrees F. The discharge pipe is 2½-3 feet above surface. Well is 2-inch. A road runs south 30 rods east of this well. This is 80 rods east of Section corners.

John Swanson's well is in southwest part of SE¼ Section 2 and is 84 feet deep. It was made about 1899. It was largely sand and there is sand from here east. The water is under a bed of cemented material. It is a 3-inch hole with 1¼-inch pipe. It flows a stream at 1½ feet above surface, 3 quarts a minute. Some water at 64 feet. Aneroid 29.385 at well at 5:00 p.m. = 750 feet ±. Temperature, 45 degrees F.

There are strong artesian springs on Mr. Swanson's land along the small stream west of his house. He cannot touch bottom with poles 20 feet long. They are in a peaty bog and burst out in new places from time to time. Mr. Swanson says a bog is struck at Peterson's well into which his pipe would sink if it were not suspended.

From Swanson's I go north 1/2 mile then east 1/4 mile to a schoolhouse. Aneroid 29.250 on high point just west of schoolhouse in Section 2; 29.240, 906 feet (notes June 26, 1912), at high point on town line 20 rods east of corner Sections 1 and 2, 35 and 36, where I made it 905 feet A.T. last night; 29.265, 874 feet (notes June 26, 1912), base of wave cut bank 1/4 mile north of town line; 29.285 on beach 20-30 rods north = 850-855 feet; 29.350 under next bank, probably a lake level, 30 rods south of section corners = 808 feet (notes June 26, 1912); 29.390 at Newberry at 6:D p.m. = 765 feet.

Mr. Tower ascertained that J. C. Foster, in Section 36, T.46N., R.10W., 5 miles north of Newberry, has well 41 feet. Mr. Green made one of similar depth in east part Section 35.

Dr. A. W. Nicholson of Newberry analyzed water from a well near the asylum 128 feet deep that has 18 feet of water. Analysis made about 1893:

	Parts per 100
Reaction alkaline	
Carb. of lime and magnesium	0.0652
Ferric oxide	Trace
Chlorides	Negative
<u>Organic matter</u>	
Permanganese test	Negative
Sugar test	Negative

The Hunter well in Section 9, T.45N., R.10W., is said to have flowed a full 1-$\frac{1}{3}$ inch stream at first.

September 6, 1905, 7:15 a.m.

Newberry, Michigan. Aneroid 29.490 = 765 feet. We go east to range line and then south. Aneroid 29.500 at railroad track at range line = 755 feet at 7:35 a.m.; 29.485 at corner Sections 30 and 31, 25 and 36 = 780 feet. About 1/4 mile south of corners is a low ridge, aneroid 29.470 = 755 feet. A well in east part Section 31 is only 12 feet at an altitude 790 feet ±.

Aneroid 29.460 at a well defined beach at top of bank. The base is 8-10 feet lower. This is the 800-foot beach. It is 100 rods north of town corners. It is also about 100 rods east of the corners, for it runs northwest-southeast. Above this beach is an undulating surface rising rapidly southward. Aneroid 29.430 at town corners. The upper beach crosses the town line 1/2 mile west of here and runs south on east side of the asylum buildings.

Aneroid 29.415, 845 feet ±, on a beach 50 rods south of town corners. Same one as read 29.285 last night south of Newberry (see p. 56 of notebook). It runs northwest across town line 80 rods west of town corners. It continues from this line of Sections 1 and 6 in east-southeast course. The high beach by the asylum does not run out to this line for the altitude is too low. Aneroid 29.400, 860 feet ±, at southeast corner of asylum grounds. The highest beach is about 875 feet. There is an uneven surface from here south and east.

Aneroid 29.400 at corner Sections 6, 7, 1 and 12 = 860 feet. A road runs east from here to the wells of which Mr. Somerville gaves us notes September 4. About middle of line Sections 7 and 12 is a crossroad. Aneroid 29.395 at a flat tract just south of this crossroad = 865 feet ±. This was timbered with pine, hemlock, birch, etc, but 1/2 mile west and a mile east is maple forest still standing. This plain seems to be free from boulders but the undulating land north of it is very bouldery and the boulders are

numerous clear down to the swamp along the railroad. There seems to be a very gradual southward slope. About a mile south on it the aneroid reads 29.410 at 8:35 a.m. = 850 feet.

We soon leave the range line and run southeast for 1½ miles or more to a fork in road, aneroid 29.430 = 835-840 feet. This is probably in Section 29. We then turn south and traverse a gently undulating plain that was timbered with pine. There is hardwood standing within a mile north, east and west of this road.

Aneroid 29.470 = 800 feet ± A.T. at a small pond in a huckleberry marsh where there used to be a mill. This road passes the west end of the pond. Time, 9:00 a.m. The ridges are 15-20 feet higher. About 1/2 mile south and 1/2 mile east of the mill site we enter hardwood timber. Aneroid 29.470 at north edge = 800 feet. This border seems to run east-west. In 1/2 mile or so we enter a sandy strip with pine and some. Aneroid 29.410 on a sharp sand hill at west side of road 1/2 mile south from north edge of hardwood = 850 feet.

There are occasional boulders and cobblestones on the rolling tract south from here. The aneroid reads 29.430-440 = 830-840 feet on ridges, as a rule, though a few points are higher. The altitude seems to increase gradually southward. Aneroid 29.415 = 850 feet at a clearing 2 miles or more south from the north edge of hardwood at 10:15 a.m.

About a mile farther south we enter a pine choppings and the road there turns southwest, aneroid 29.440 = 830 feet ±. We go a mile in that direction, then south about a mile through an undulating hardwood belt with occasional large boulders. The aneroid ranges from 29.420 to 29.460 on it or altitude 850 to 810 feet. We then enter a pine belt of much greater extent than those farther north. It is largely chopped off but clumps and scattered trees remain. Aneroid 29.460 at north edge of the pine at 11:10

a.m. = 810 feet; 29.480, 790 feet, at place where we stop for dinner 1/2 mile south of edge of hardwood on the pine belt at 11:20 a.m.

We begin more rapid descent south of here and soon drop below a sand ridge 25-30 feet high. Aneroid 29.540 at south base. The road follows this westward 1/2 mile or more and then strikes southwest 1/2 mile to a small stream. Aneroid 29.620 at stream by an abandoned log shanty = 660 feet; 29.570 on bluff east side of stream. There is jack pine on the east side this stream with scattered Norway pine. Along the stream are spruce and white pine. The stream flows southwestward.

The country covered with pine is clear sand with scarcely a sign of a pebble. The hardwood had a pebbly sand and an occasional boulder. On west side of this creek where we stopped for a drink at old cabin the altitude reaches 15-20 feet higher than on southeast side. Aneroid 29.550 on highest points on bluff = 725 feet. Within a mile south the road descends to a lower plain. Aneroid 29.640 at north edge at base of a sandy ridge 25 feet high = 640 feet; 29.650, 630 feet, at swamp by a stream running west a few rods south of this bluff.

Aneroid 29.670, 615 feet ±, at Millecoquin Lake at 1:30 p.m. We come to its east side first and follow the east side south from Section 1, T.43N., R.10W. Aneroid 29.670 at south end of Millecoquin Lake at 2:10 p.m. = 615 feet. The deepest part of this lake is 12 feet but much of it is less than 6 feet. The west bank of the lake rises above the Nipissing beach 20-30 feet or more and is partly cleared for farms. There is limestone along west bank of the outlet of this lake. Aneroid 29.655 at outlet of lake by the railroad at Graylock at 2:45 p.m.

Aneroid 29.635 at Graylock Station = 630 feet. Note weather change since 2:00 p.m. This is nearly at the level of the Nipissing beach. There

is clay on the banks of the stream to 12 feet ± above water level. The limestone land also has a clay soil. We come out to a north-south road near middle of line Sections 10 and 11, T.43N., R.10W. I am told by Constantine Martin of Engadine that the limestone runs from Engadine to Scott's Point with practically no interruption. It also runs to Manistique Lake from Engadine and extends east to Graylock and Millecoquin Lake.

We go west on line Sections 3 and 10, T.43N., R.10W. Aneroid 29.610 = 650 feet ± at corner Sections 3, 4, 9 and 10, T.43N., R.10W. We take road north. This limestone tract has hardwood timber all the way from Engadine to McMillan. Aneroid 29.585 at base of a cliff in northwest part Section 3 that may be wave cut. It is not clear, however, that it marks a lake level.

The wells for 1-2 miles south of Rapensville differ in depth about as the altitude varies. The shallowest in Sections 3 and 4, T.43N., R.10W., are 40 feet and the deepest about 80 feet. They increase in depth to 115 and 118 feet in Sections 27 and 28, T.44N., R.10W., on the highest points at altitude 710-725 feet A.T.

Aneroid 29.570 at town line corner Sections 3, 4, 33 and 34 at 3:50 p.m.; 29.530 = 720 feet on highest point on line Sections 27 and 28.

I am told at Rapensville that the limestone country runs east to the stream that comes into Millecoquin Lake from the north. Aneroid 29.550 at white church in southeast corner Section 21 by crossroads at 4:06 p.m. = 700 feet ±; 29.510 on ridge near north end line Sections 21 and 22, T.44N., R.10W. = 745 feet. This has limestone near surface. Aneroid 29.590 at stream only 1/4 mile north of this ridge = 670 feet ±. This seems to be at the north edge of the ledges. The north part of Sections 15 and 16 has a boulder-strewn drift with gravelly and sandy patches but mainly a clay soil. The limestone tracts are all clay on this road.

The road enters a swamp near center of T.44N., R.10W. Aneroid 29.590 at south border = 673 feet ±; 29.530 = 725 feet at north border at base of steep sandy ridges 40-50 feet. The swamp is nearly 2 miles across on this road. Aneroid 29.480 on top of the sand ridges probably within a short distance of the north line of T.44N., R.10W., = 770 feet A.T. There are swamps north of these high sand ridges nearly as high as the ridges. Aneroid 29.485 at edge of the dry land where the hardwood forest sets in = 765 feet ±. The swamp had cedar and spruce. The aneroid reads 29.450 by the time we reach the line of Townships 44 and 45 North. Boulders set in here.

Aneroid 29.380 on sharp gravel ridge about 2 miles from south line of township at 5:20 p.m. = 860 feet. This may be a beach of Lake Algonquin but it does not run east as the land there is lower. It has the bedding of a beach and seems to run west with even crest. Another ridge 1/4 mile north has same height but is bouldery at top = 860 feet. About a mile from here in NE¼ Section 21, I come to a farm, the first one north of the swamp.

This is 1/4 mile south of center of township at residence of Isaac Pentland in northeast corner Section 21. His well, 85 feet deep, has 20 feet of water. The beds vary some, there being gravel, sand, thin clay beds, etc. It is 3-inch pipe. Well made about 1890. Aneroid 29.415 at well at 5:30 p.m. = 830 feet. This plain extends only 40 rods north of the center of township.

Aneroid 29.500 at south edge of swamp near middle of line Sections 15 and 16 = 750 feet. There are strong springs issuing here, one of which supplies a watering trough.

Aneroid 29.515, 740 feet, at the Pentland flowing well in southwest corner Section 10 at 5:50 p.m.; 29.400 at schoolhouse = 850 feet; 29.530 at swamp 80 rods north of corner Sections 3, 4, 9 and 10 = 725 feet.

The limestone tract that we traversed north of Engadine this afternoon is very productive land, excellent for orchards as well as grass and grain. The soil has more clay and is much stronger than on hardwood belts in thick drift in this region, especially if soil is sandy.

September 7, 1905, 6:00 a.m.

Aneroid 29.510 at Newberry = 765 feet A.T. There is a flowing well on northwest end of the largest Manistique lake 120 feet deep. Gill Helmer, owner; James Somerville, driller. Made about 1901; 3-inch pipe. Mr. Helmer has store and hotel.

The Hunter well in west part Section 9, T.44N., R.10W., is 123 feet. It flowed a stream when first made. It flowed over a pipe 11 feet above ground a good strong flow.

Aneroid 29.510, 765 feet, at Newberry at 8:30 a.m.; 29.525 at Newberry at 9:30 a.m. I take road south. Aneroid 29.495 at base of bank at beach 30 rods south of corner Sections 25, 26, 35 and 36 = 795 feet; 29.450 at next beach 1/2 mile south; 29.425 at highest beach at foot of cut bank = 874 feet; 29.405 at top of bluff = 898 feet.

Barney Tenker has well 135 feet in southwest corner Section 36 that has 19 feet of water. Made about 12 years ago by James Somerville. Aneroid 29.405 = 880 feet; 29.395 at knoll southeast of this well on town line = 906 feet.

The shore line that I crossed 100 rods north of town line (874 feet A.T.) runs west fully 120 rods and then doubles around to the south.

The schoolhouse well in west (?) part Section 1 is 138 feet. It was made by James Somerville. Aneroid 29.410 at schoolhouse.

Aneroid 29.540 at Swanson's well in southwest part SE¼ Section 2, (see notes September 5) = 750 feet; 29.570 at Peterson's well in NW¼

Section 11 (notes September 5) = 740 feet.

Aneroid 29.580, 730 feet, at Twin Lakes in Section 11 at 10:30 a.m.; 29.460 at old beach east of schoolhouse in west part Section 10 at 10:45 a.m. = 860 feet. I changed barometer here to 860 feet as it reads 835 feet this morning.

Aneroid 29.555 at Pentland's flowing well = 746 feet; 29.455 at center of township by Isaac Pentland's = 830 feet at 11:10 a.m. Near middle of north side Section 21 Mr. Pentland has a well in a ravine at house that struck water at 22 feet and is 30 feet.

Aneroid 29.480 at Mr. R. Van Dusen's in northeast corner Section 20 at 11:40 a.m. = 800-810 feet. His well is only 18 feet deep. About 1/4 mile west is a spring brook with trout in it. Aneroid 29.480 at Mr. Van Dusen's at 12:40 p.m. = 800 feet.

Aneroid 29.435 at middle of line Sections 20 and 21 = 840 feet; 29.415 at a narrow east-west sandy ridge near quarter post Sections 28 and 29 = 860 feet. It seems like a beach washed up from the south, for land is lower south of it. Aneroid 29.430 at a second ridge about 40 rods south = 850 feet. Other larger and sandier ridges occur 1/2 mile south that are 10-15 feet high, aneroid 29.440 at base; 29.425 at top = 855 feet. These may have been wind formed. The drift is all rather sandy and has very few boulders. These low ridges occur at frequent intervals from here south to the bend of road on town line at corner Sections 32, 33, 4 and 5. Aneroid 29.505 at town line = 780 feet. There is a swamp about 1/4 mile southeast from here at slightly lower level.

Aneroid 29.450 = 835 feet at a ridge running northwest-southeast across middle of line Sections 5 and 32. It is 20 feet ± in height and is probably due to wind action. I see no pebbles in it. It is covered with maple and other hardwood trees like the lower land beside it. There is

another similar ridge about a mile west as well as ridges 5-6 feet high. The general altitude is between 820 and 840 feet A.T. for the 2 miles west to the township corners. There is only an occasional pebble and I see no boulders. The soil is a sandy loam or, in places, light sand.

Aneroid 29.450 at township corners, Townships 44 and 45 North, Ranges 10 and 11 West = 840 feet A.T.; 29.410 = 870 feet on top of a sand ridge about 100 rods south and 20 rods east of township corners. This leads east across the NW¼ Section 6 but does not run west of the town line but a few rods. Aneroid 29.455 on plain south of sand ridge. This is rather gravelly and has basins. It is likely to be an outwash--835 feet. Aneroid 29.455 at corner Sections 6, 7, 1 and 12 at 2:07 p.m. at Michael Hager's in northeast corner Section 12 = 835 feet. His well is 66 feet. There was sandy gravel 30 feet, then clay 1 foot, and black muck 2 feet that resembled peat. Below this was sand and that has water at about 40 feet. Made by Somerville. The head is -10 feet.

There are occasional large boulders in Sections 7 and 12 on a flat tract. Aneroid 29.470 at corner Sections 7 and 18, 12 and 13 = 820 feet ±.

Wm. Stoddard, in Section 18 in west part, has a well 34 feet--a 3-inch well--and no rock was struck. Water is from gravel. It has several feet of water. I am told that the SW¼ Section 19 has limestone near surface.

There is a flowing well in southeast corner Section 4, T.43N., R.10W., in limestone that is only 60 feet deep. Peter Proten, owner. Made in 1905. It is a strong flow.

A well in Engadine belonging to the Lumber Company is 206 feet deep that flowed for a month or more. It was made in July, 1905. It passed through 40 feet of quicksand before striking rock, and it is thought the sand has choked the well. The sand works down in crevices in the rock outside the well.

The well at the Engadine mill is 146 feet. It is about 20 rods from the well of Lumber Company. Just south and west of the village rock is at top of ground and it sets in a mile north.

Wm. Greenwood has a well 1/2 mile north of Engadine 35 feet deep that does not reach rock but rock is at surface 1/2 mile farther north. The above information is by Mr. Greenwood.

We go west between Sections 12 and 13, T.44N., R.11W., across a flat tract with gravelly sand and an occasional boulder.

A well in northwest part Section 13 is only 11 feet, and one in northeast part Section 14 is 12 feet but farther west and north they are 20 to 31 feet. Water is found in gravel.

There is a gradual ascent westward and a slight ridging like a beach is found along or near the line of Sections 11 and 14 near a log schoolhouse that stands in Section 14. Aneroid 29.440 on the ridge, 845 feet. It is 3-5 feet high and 15-20 rods wide. It runs across north edge of NE¼ Section 14 and south edge of SW¼ Section 11 and bears west-southwest into Section 15. Aneroid 29.440 on ridge at corner Sections 10, 11, 14 and 15 at 3:15 p.m.; 29.500 at middle of line Sections 10 and 15.

The land continues descending to west and north but there is a rapid rise south as well as east from here. We turn south 1/4 mile to a ridge at cemetery, aneroid 29.455 = 830 feet ±. This seems to be the played-out end of a bar on a ridge, for there is a descent to west, south and north from it, while to the east is a gradual rise along the crest of the ridge to the beach or bar at corner Sections 10, 11, 14 and 15. We follow the ridge southwest across Section 15 into 16 and make very little descent for over a mile, aneroid 29.465 being the usual reading. The road swings around to the south in Section 16 to a clearing, and we pass numerous limestone blocks and numerous boulders for 1/4-1/2 mile north of the clearing.

Aneroid 29.470 at north side of clearing at 4:00 p.m.

At corner of Sections 16, 17, 20 and 21 where a road leads south is the brow of a bluff 30-35 feet high. Aneroid 29.505 at base of bluff 40 rods west of section corners = 780 feet ±. There is no limestone exposed in this bluff. It is cobbly at top with sand below.

Aneroid 29.530 at cedar swamp about 1/4 mile farther west = 760 feet ±. One-quarter mile farther we enter a clay tract. Aneroid 29.540 at east edge of clay. There are occasional boulders in the clay, granite, greenstone, etc., with rarely a limestone slab.

Aneroid 29.570 at corner Sections 17, 18,19 and 20; 29.585 = 700-715 feet at South Manistique Lake (now called Whitefish Lake). There is a clay bluff on north shore 30 feet ± high that is clear cut. The lake is surrounded by land 20-40 feet above it within a short distance back from the shore.

A well at Curtis for Cook, Curtis and Miller is 72 feet and has 35 feet of water.

W. M. Carpenter has a well in northeast of Section 19 that is 35 feet--nearly all clay.

We return to South Manistique Lake. Aneroid 29.585 at 5:00 p.m. We go south along the range line through a till tract to corner Sections 30, 31, 25 and 26. It rises 10 to 25 feet or more above the lake. On the line of Sections 31and 36 the road is in a cedar swamp most of the way. It seems not to extend far east, however, unless in narrow spurs. The swamp is underlaid by clay of reddish color similar to the till to the north. The black muck seems to average about a foot. There are sandy places where streams are flowing. Aneroid 29.580 in the swamp, or less than 5 feet above lake level = 720 feet ±. This swamp reaches nearly to south end of line of Sections 1 and 6 but only the north and west parts of

Section 6 are in it, the north part being along a small stream that comes in from the east.

Aneroid 29.520 on bluff south of swamp near corner Sections 1, 12, 6 and 7 at 5:50 p.m. = 775 feet ±. There are low sandy ridges here running east-west across the range line. These are north of the section corners where a road runs west on south side of South Manistique (or Whitefish) Lake. A very flat tract extends south from the corner of Sections 6, 7, 1 and 12 that has a gravelly sand with an occasional small boulder. It seems to be nearly a dead level. It has hardwood timber with a large amount of maple. There is an occasional hemlock tree.

We cross a low gravelly ridge just north from where the road turns east from the range line. Aneroid 29.510 on crest. This is near south end of line Sections 18 and 13. It seems to be a beach. There is a lower tract south of it. The gravel is waterworn and largely of limestone pebbles. Aneroid 29.520 on the plain south. The swamp is several feet lower.

Aneroid 29.500 at gravelly ridge 1/2 mile northwest of Corinne = 780 feet ±; 29.510 at Corinne at 7:00 p.m. = 764 feet A.T. There is limestone at surface for a mile west of this village. I am told by Neil Carmichael, a land broker of Corinne, that the limestone only extends a mile north of Gould City. For 4 miles north of there is cedar, tamarac and spruce swamp. The limestone runs east along railroad to Engadine. From Corinne the west border runs southeast about a mile and then south toward Scott's Point to within 2 miles of the point. There, a sandy jack pine belt sets in with no rock.

A well at schoolhouse a mile north of Scott's Point, 40 feet deep, did not strike limestone. It passed through sand to a crust of cemented sand above the water.

West from Corinne there is no limestone for 8 miles or to Hunts Spur. There is a tract of clay loam from the railroad south to within 1-2 miles of Lake Michigan that covers T.42N., R.12W., and extends a little into T.41N., R.12W. It is excellent farming land and is very level. It now carries cedar and spruce, second growth. The original timber was cedar and spruce with a little pine and, on ridges, some hardwood. There is the same land for 2 miles north of the railroad in south half of T.43N., R.12W. The railroad runs through the northest part of this tract. Most of the descent from this tract to Lake Michigan is made within 1-2 miles of the lake.

There is a flowing well from the limestone at Hunts Spur, owned by the Michigan Cedar Company or the Francis Palms Estate. It has been running 15 years or more. It is about 3-inch. It will throw a jet 20 feet high and was used by hose attachment to clean off logs etc. There is a weaker flow at the barn owned by the same company at Hunts Spur. Limestone is near the surface in this vicinity.

A well at the kilns in Corinne was sunk about 1888 to a depth of 180 feet ± in order to get a flow but the head is 25 feet below the surface. It was not fully cased so may not have shown the full head.

The wells in Corinne are generally between 65 and 80 feet and the general head is about -25 feet. The depth is similar at Gould City. Rock is usually at less than 10 feet depth. One shallow well, however, was made by James Haley. It is only 15 feet.

The railroad profile shows a divide or crest 6 miles east of Corinne, 773 feet A.T. There is a continuous westward descent to the Milakokia River 9.6 miles where the altitude is 640 feet on top of bridge. The first mile post east, Mile Post 406, is 668 feet. Hunts Spur is at Mile Post 407

and is 684 feet. There is a wagon road from Hunts Spur south to Lake Michigan 6 miles. The east edge of the swampy land 1.6 miles west of Corinne is 753 feet at Mile Post 413, so there is a fall of 69 feet in 6 miles west to Hunts Spur, although a flat tract that seems level to the eye. (See notes November 4, 1905 on trip by rail across this region.)

September 8, 1905.

Corinne, Michigan (Viola Post Office). Aneroid 29.590 = 764 feet at 6:45 a.m. The well, as noted, is 113 feet deep and has head -25 feet. Mr. Carmichael says the swamp north of Gould City covers practically all of Sections 2, 3, 4, 9, 10, 11, 14, 15, 16, 20, 21, 22, 23, 27 and 28 and the east edge of Sections 5 and 8, T.43N., R.11W., and extends north over Sections 33, 34 and 35 into Sections 26 and 27, T.44N., R.11W. It has a clay bottom like the land on east edge of Whitefish (or South Manistique) Lake. East of this swamp limestone is near the surface. The soil is a loose-textured sandy loam near the edge of the swamp but changes to clay upon passing east toward the Rapensville Settlement.

The swamp north of Gould City just outlined has cedar and spruce with a little pine. There are no ridges in the swamp of any consequence and the country east is only slightly uneven.

Mr. Carmichael has seen limestone in Section 19, T.43N., R.11W and it extends into the north part of Section 30 and continues past Corinne, this village being on the west edge of it. The limestone extends very little north of the railroad east from Corinne to three miles east of Gould City, for the swamp is close by the railroad. The limestone is conspicuous for 2 miles west of Engadine along the railroad, but does not show much farther west on north side of track until near Corinne.

Aneroid 29.610 at Mile Post 414, about 1/3 mile west of Corinne Station at 7:35 a.m.; 29.625 about 3/4 mile west of Corinne at edge of the cedar

swamp. There is considerable tamarack and spruce here as well as arbor vitae. There is a lake on north side of track in north part Section 36, T.43N., R.12W.

Aneroid 29.610 at Corinne at 8:15 a.m. = 764 feet. In the northeast corner of Section 31, T.43N., R.11W., a gravelly ridge sets in which runs east and connects with a limestone hill in Section 32. The aneroid reads 29.595 on the ridge, or about 790 feet A.T. Highest points may be 800 feet. Aneroid 29.660 at crossroads corner Sections 28, 29, 32 and 33 about 1/2 mile south of Gould City; it seems to be about same altitude as Gould City, or 769 feet A.T. Aneroid 29.680 at quarter post of Sections 28 and 33.

Aneroid 29.670 at State Senator McEachern's residence in north part = 755 feet. The well here is about 80 feet deep and has about 12-14 feet of gravel on the limestone. The flat north, along section line, has only 2-4 feet of soil above the rock. The limestone ridges around here generally have patches of water worn gravel on them. The soil is of good quality and crops excellent.

Aneroid 29.650 at Gould City, 769 feet. A well here at F. E. Ferguson's store is 116 feet and has head -12 feet. There are other wells a little deeper.

Simmons Lumber Company have a flowing well 4½ miles south and 2 miles east of Gould City. Depth, 108 feet. Head only 3 feet above surface. It stops flowing in the fall and is not running now but runs about 9 months of year. It is a 2-inch pipe and is in limestone nearly all the way. It is on north bank of Duel Lake in Section 23, T.42N., R.11W. There is sand from this lake east and south but limestone land north and west.

Aneroid 29.650, 769 feet, at Gould City at 9:20 a.m. The land is very stony north of Gould City for a mile to the edge of the swamp.

Aneroid 29.630 at swamp = 780 feet ± A.T.

We take road west on line Sections 20 and 29, 19 and 30 and find a limestone belt nearly all the way to the range line. Aneroid 29.640, 770 feet, at corner Sections 19 and 30, 24 and 25 at 10:15 a.m. The east side of Section 25 is dry land and the southeast part of Section 24, but there is a strip of swamp that lies west of it which is 1/2 mile ± in width and runs northward, we are told, to Whitefish Lake. It runs into Section 19 a little and causes the deflection of the road. It is 10-15 feet lower than the plain of hardwood on its east border. West of this is hardwood land running south into the northwest part of Section 25 and northeast of Section 26 a short distance. The swamp extends a little into Sections 22 and 23 in south parts but these sections are mainly dry land with a gravelly loam soil.

The road at the deflection in Section 19 follows a low gravelly ridge much of the way that runs on the east border of the swamp. Aneroid 29.650 = 775 feet ± at the ridge on range line in southwest corner Section 18 at 10:30 a.m.; 29.650 at corner Sections 6, 7, 1 and 12 at 10:50 a.m. = 775 feet.

We take road west and within 1/2 mile come to the swamp referred to above that runs north to Whitefish Lake. Aneroid 29.685 = 740 feet at east edge of swamp; 29.690 = 735 feet ± at a small stream in west part. The swamp is less than 1/2 mile wide here and this seems to be less than usual width. There is a sandy ridge along its east border, but on the west the road follows a loamy strip of dry land 10-15 feet above the swamps on each side. The one on south side of road extends west about 1/2 mile, keeping within 40 rods of the road. On north side, it is farther to the swamp.

About 1/3 of Section 12 is dry land on the east side of section and in northwest corner. Nearly all of Section 11 is hardwood land with altitude some lower than along the range line. Aneroid 29.700 at a stream on line Sections 2 and 11 that drains the swamp northwest to Whitefish Lake at 11:15 a.m. = 725 feet ±. There is a great deal of limestone here in the stream bed and banks in loose blocks. The rock is probably not transported far but I do not find ledges outcropping here. This outlet has banks 10-12 feet high and dry land on its borders with hardwood timber.

Aneroid 29.665 at corner Sections 2, 3, 10 and 11, T.43N., R.12W., = 760 feet ±. From here the road leads into Section 3 instead of running direct west. There is a north-south road on line of Sections 2 and 3, 10 and 11. There are limestone blocks in Section 3 in a few places suggesting the occurrence of ledges underneath.

Aneroid 29.650, 770 feet, at Mr. Hemphill's at noon in northeast quarter NW¼ Section 4, T.43N., R.12w. The well here is 31 feet deep and has about 2 feet of water. There is a lake just south of his house, 20 feet lower, aneroid 29.670 = 750 feet.

I am told that the big swamp sets in south of here in south part of Section 9. The hardwood belt covers most of the northern one-third of the township. Aneroid 29.630 at Mr. Hemphill's at 1:00 p.m. = 770 feet. Boulders are quite numerous in Section 4 and occasional limestone blocks with them, but the well did not reach rock.

Aneroid 29.700 at Mud Creek in Section 5 = 710 feet. This has a narrow swamp 30 rods wide bordering it. Aneroid 29.650 = 760 feet ± on uplands in Section 6 on southwest side of creek. There is a gravelly loam soil here in the country to the east. There are a few boulders. The surface is flat, and it is timbered with hardwood--maple, birch, etc., and a few hemlocks.

Aneroid 29.635 at crossroads 3 miles west of Mr. Memphills = 770 feet; 29.655 = 750 feet at lake in Section 1, T.43N., R.13W. There is hardwood on south side this lake as well as north. With the huckleberry marshes around it covers more than a square mile. Its surface is only 5-10 feet below the hardwood tract on its north border. Aneroid 29.625 on a ridge about a mile west of the west part of the lake. It is sandy and has scarcely the form and regularity of a beach, 775 feet ±. It is the first ridge noted since crossing Mud Creek in Section 5, T.43N., R.12W.

At hill farther west we come to a steep bluff. Aneroid 29.640, 760 feet at top; 29.665, 740 feet ±, at base. It runs nearly east-west. It seems to be the valley of a small creek for after turning north 1/4 mile we rise from it to the same level again.

Aneroid 29.625, 775 feet, at Mr. Ford's north side of town line in Section 34, T.44N., R.13W. There is a beach line running east-west across south part of Section 34 about 1/4 mile north of the town line. Aneroid 29.615, 780 feet ±, on crest. We take the county road north. Aneroid 29.625 1/2 mile north of town line on south bluff of Mud Creek = 770 feet; 29.670 in swamp along creek = 725 feet; 29.700 at creek at 4:00 p.m. = 700 feet. There is red clay along the creek with banks several feet high. A rise of 15-20 feet is made within a few rods back from the creek.

Aneroid 29.650 at southwest corner Section 22 at a schoolhouse = 745 feet. I am told that limestone is struck at Blaney in southeast corner Section 16, T.43N., R.13w., and on south from there past Hunts Spur. It bears southeast of Blaney also. The eastern part of T.43N., R.13W., is in the swamp that extends to Corinne.

Wells are shallow in south part of T.44N., R.13W., along the county road. In the east part of this township, in Section 12, are 2 wells 80 feet and they terminate in quicksand. There are a great many boulders

there--Enos Stafford and Jame Stafford. The water rises 35 feet.

There is a swamp setting in 1-3/4 miles west of the schoolhouse in SW¼ Section 20 and northwest of 29 that extends west beyond the river. A considerable part of Section 21 is swampy in east part and this runs east through north part of Section 22 to a lake that lies mainly in Section 23 and discharges east. It is called Stewart's Lake--from Alex Stewart who lives on its bank.

There is a clay soil in the dry land in Sections 21, 22, 27 and 28 and also under the swamps, though there are some sandy places in the swamps and Mr. Stewart says an occasional low sandy ridge with hemlock timber. Aneroid 29.675 in swamp on north part of line Sections 21 and 22 (the swamp that runs east to Stewart's Lake) = 725 feet ±. The surface is undulating in Section 15.

Aneroid 29.630 at a ridge in west part Section 15 at Samuel Burns. A well here is only 14 feet = 765 feet. The east and north edges of Section 17 are dry land but the central, southern and western parts are swamp and so is the southwest part of Section 16.

Thomas Kennedy, in NE¼ Section 14, has a well about 70 feet deep. There is very little rise of water.

The ridge that Mr. Burns is on runs west across north part of Section 16 into Section 8 with the appearance of a morainic crest. The river breaks through it in Section 8 for there is reported to be high hardwood land on the west side in Section 18 (SW¼) on the Holbrook farm. The north edge of Section 17 is on the moraine clear to the river. Aneroid 29.690 in river swamp in NW¼ Section 17 at 5:30 p.m. = 700 feet ±.

I am told by W. J. Holmes that there is high land in Southwest Section 18, northwest of 19, the southeast of Section 13 that has more or less hardwood. On north, west and south is pine timber, with sand ridges without

boulders on it and with marshes interspersed. Aneroid 29.700 at river at Germfask = 690 feet ±; 29.680 at hotel = 700 feet ±.

A well at Blaney for the Wm. Mueller Lumber Company is 113 feet to rock and total depth 214 feet.

1.	Clay loam and sand	15 ft.
2.	Quicksand	26 "
3.	Gravel	4 "
4.	Blue clay with boulders and streaks of sand	68 "
5.	Blue shale	101 "

Water has a head 50 feet below surface. It has a 'bog ore' tast, so it is not used. Some water is obtained at 42 feet and some in the bottom of well.

At the hotel in Germfask a well now being drilled--5-inch well. It penetrated sand 23 feet, and blue clay with pebbles 22 feet. Sand of blue color where well is now, at 50 feet depth. This is about 20 feet above river level. Geo. W. Gray of Cooks Post Office, Michigan, is the driller.

In Garden there are 5 wells in the village that flow and one at Van's Harbor a mile distant. The one at Van's Harbor belongs to Louis Van Winkle. It is 233 feet deep; 5-inch well cased 40 feet. Limestone was struck at 18 feet under a bouldery white clay. It was all limestone of various kinds--blue, white, rotten, etc. It flowed 60 gallons a minute when first made. The head is +18 feet. Finished in March, 1905. Altitude 8 feet above Bay de Noc.

Wm. Stillwagon, a hardware dealer at Garden has a flow 175 feet with 40 feet of casing. It was made in an old well 82 feet deep that was weak and easily pumped down. At 107 feet the first flow was struck but it was very weak. At 173 feet the strong flow was struck. Diameter, 4-inch. Made in 1902. Head, +16 feet. Altitude, 8 or 10 feet above Lake Michigan level. Rate of flow, 40 gallons a minute. Water is used for fish pond as well as domestic use--sprinkling, etc.

Boudreau and Disco, hardware and grocery firm, have a flow 199 feet, 5-inch pipe. Cased 38 feet. This is not enough to prevent leakage. Rock at about 20 feet. Clay above rock is red at top and pale color below and quite bouldery. Made in 1903. Water veins at 107 feet (weak flow); 170 feet, strong flow. There was a leakage at 60 feet that took some of the flow but it is now cased out. Rate of flow, 30 gallons a minute. Head, +18 feet. It is 8 feet ± above Lake Michigan.

Village of Garden has a flow that was 182 feet with no casing except a seedbag around pipe. It was extended in 1902 to 195 feet and cased 52 feet. It struck limestone under red clay and sand at 14 feet. Altitude, 12-13 feet above Lake Michigan. Flow is strong in wet season (25 gallons ± a minute) but very weak in dry seasons--July to October and January to April. Head, +6 feet.

Another village well is 220 feet. Rock at 6 feet under clay and sand. Cased 42 feet. Made in 1903. Main flow is at 193 feet. Altitude, 15 feet ± above lake. Rate of flow, small. It was strong at first and affected the flow of the other well so it was plugged and that stopped the flow but recently it has sprung a leak and water comes up around the pump stock.

A third village well at Garden with rock at 22 feet to rock. Red clay 10 feet; gray clay and boulders 12 feet. Took 2 weeks to drill through the boulders. Made in 1905. Depth, 104 feet; diameter, 5-inch. Small flow of 8 gallons a minute. Altitude about 8 feet above lake. Head not tested.

Rock is struck in this district east of Big Bay de Noc at depths of 30 feet or less and good wells are seldom obtained at less than 75 feet depth, on ground 40 feet or less above lake level.

Two wells at Burnt Bluff, about 13 miles south of Garden, on east side of bay, are 228 feet. Rock at 3 feet. Only 25 feet of water. Altitude

about 200 feet above the lake. The depth in that region will average more than 100 feet, say 100-140 feet.

Mr. A. McDougall of Germfask tells me that the hardwood belt near this village on the north side of river starts in east part Section 5 and covers nearly ass Section 4 on that side of river--about 500 acres ±. There are nearly 200 acres of hardwood in Section 27, T.45N., R.13W, mainly in SE¼. There is a tract of 1½-2 square miles of hardwood between East Branch and main streams on each side the county line north of the junction, largely in Sections 19 and 24. (see notes September 9)

Wells were made at Seney about 15 years ago 110-115 feet deep but no flow obtained. The supply of water, however, is large.

A very large marsh with sandy ridges in it lies on the northwest side of Manistique River. It runs west about 20 miles and extends southwest nearly 20 miles down river from Germfask. Its outlines and full extent can be obtained from the land survey sheets.

September 9, 1905, 5:15 am

Aneroid 29.645 at Germfask = 700 feet ±; 29.670 at Manistique River = 680 feet ±. We walk north on railroad track a mile to the edge of the open marsh, aneroid 29.650 = 710 feet ±. There are clumps of jack pine or a scrubby pine and tamarack on it but fully 80 per cent of the land is marsh. A sand ridge 40 feet high, or 750 feet A.T., runs along the southeast border in Sections 27 and 34 but the hardwood tract in SE¼ Section 27 is said to be loamy and fertile but not stony. It is only 10-15 feet above level of marsh. The hardwood tract in Sections 4 and 5, T.44N., R.13W., has some boulders in it. Aneroid 29.655 at post office at Germfask at 7:40 a.m. = 700 feet ±; 29.680 at Manistique River = 680 feet.

We take road east on south side of river, rising into a moraine with

undulating surface and points reaching 60-70 feet above river level. Aneroid 29.610-620 on highest points in road = 750-760 feet. There are occasional boulders. Much of the soil is loamy but in places there is sand. There seems to be clay subsoil, for road gradings 2-3 feet often touch clayey loam. There are numerous saucer-like depressions on the crest and slopes of ridges, often only a few yards square and 2-4 feet deep. They appear to be glacial features and not due to wind action for there are boulders on them and on their rims.

Aneroid 29.690 at outlet of Manistique Lake at 8:30 a.m. = 690 feet ±. The banks are 8-10 feet high and sandy but the bed has numerous cobble-stones in it and a few limestone slabs.

We cross a swamp from this stream to East Branch of Manistique. North of the East Branch is rolling country with boulders and hardwood timber. The highest points are 75 feet or more above the stream, or 76-770 feet. Aneroid 29.600 at forks of road where a road is cut out straight east about 3/4 mile north from the east branch bridge at 9:15 a.m.

We go northwest on the road toward Seney about a mile to the edge of the hardwood and border of a tamarac swamp. Aneroid 29.650 at swamp at 9:30 a.m. There is a sand ridge here 30 feet or more in height. Aneroid 29.610 on highest points. This follows the border of the hardwood eastward from this road. The plain southeast of this ridge is 1/4 mile ± wide and stands less than 10 feet above it. Farther southeast is a rolling or morainic tract. We return to the road that runs east, crossing on summit. Aneroid 29.590, 780 feet ±, 1/4 mile northwest of it; 29.600 at road intersection at 9:50 a.m. = 770 feet ±. This is at the county line.

We go east 1/2 mile then south 1/2 mile and then southeast to East Branch of Manistique River. Aneroid 29.680 at river at 10:05 a.m. on line of Sections 19 and 30, T.45N., R.12W., = 700 feet ±; 29.665 at corner

Sections 19, 20, 29 and 30 = 715 feet. There is only a narrow strip of low land along East Branch here 1/4 mile ±, with morainic topography on both sides for some distance upstream to the northeast. The moraine is boulder-strewn and has limestone slabs as well as granite and other erratics. There is a loose textured till with considerable sand on the high points and a loamy clay with reddish tinge on the sags.

We go south on line of Sections 29 and 30 to the edge of the lake. The undulating land extends down nearly to the shore here and in Section 31, but directly across the lake south there is a swamp for a mile or more, beyond which we see elevated land with hardwood timber. Probably Sections 5 and 8 and east half of Sections 6 and 7 are in the swamp, if not all of these sections. Farther west, on the southwest side of the outlet, is the morainic tract I crossed east of Germfask.

Mr. Jerry Holland's well, in Section 30 east side, is 85 feet and strikes limestone at 18 feet and has head -20 feet; 5-inch well. Made about 18 years ago. Aneroid 29.650 at well = 725 feet ±.

Chas. McKinnon has a well in rock--across road in Section--is 86 feet, and strikes limestone at 40 feet. It is a strong well. The altitude is 25 feet or more above the Holland well. Made in 1904. Aneroid 29.620 at well = 755 feet ±.

Mr. Greenfield, 3 miles east, has a well in limestone. Other wells north of the lake get water in sand.

Mr. Holland outlined for me the extent of the hardwood and rolling land in this township. There is none west of the East Branch farther north than Section 19. A swamp covers Sections 16, 17 and 18 and north part of Sections 20 and 21 and northwest part of Section 15 to a lake near corner Sections 10, 11, 14 and 15. From the north side of this lake a spur of rolling hardwood land runs west to the East Branch in Sections 4

and 9. The north half of Section 3 and south half of Section 10 are low. There is a spur of high land running northwest from Section 2 into SE¼ Section 34, T.46N., R.12W. Another spur extends from Sections 1 and 2 north along line of Sections 35 and 36 nearly to the South Shore Railroad but the remainder of Sections 35 and 36 and northeast part of Section 1 are low and the low land extends east from there to McMillan. A spur runs up to McMillan from the south.

We return to the corner Sections 19, 20, 29 and 30, aneroid 29.655 at 10:50 a.m., and take road east, rising to a high point near east end of line of Sections 20 and 29.

At schoolhouse in NE¼ Section 29, struck limestone at 40 feet and the well is 96 feet. It has 30-35 feet of water. Aneroid 29.600 at schoolhouse at 11:10 a.m. = 770 feet ±. This is 80 rods from east end of section line. The altitude is 5-6 feet higher a few rods south.

Aneroid 29.590 at high point near middle of line Sections 21 and 28 = 775 feet ±.

John Richards, in south part Section 21 in southwest corner SE¼, has a well 76 feet deep that has only 7½ feet of water. There was clay 12 feet and the rest sand to rock at bottom. It was made about 10 years ago. Diameter, 3-inch. Aneroid 29.600 at well = 770 feet.

Aneroid 29.640 at corner Sections 21, 22, 27 and 28 in a sag = 730 feet. A ridge 1/2 mile north is 30-40 feet higher and there is also higher land to the south. Boulders are common and also limestone slabs. Aneroid 29.570, 780-790 feet, on high ridge near corner Sections 22, 23, 26 and 27. There is a swamp 1/4-1/2 mile south and beyond this a ridge.

A well in northwest corner Section 26 is 40 feet deep and does not reach rock. Aneroid 29.580 at well.

This ridge has a sandier soil than the lower ridges to the west. Aneroid 29.570, 780 feet, at corner Sections 23, 24, 25 and 26 on ridge. The altitude is 8-10 feet higher a short distance north. This ridge overlooks Round Lake (or North Manistique on map). There is high land on north as well as south sides of this lake and a very high point northeast of it a mile or more. Aneroid 29.630, 710 feet ±, at Round Lake in Section 24; 29.570, 760 feet ±, at corner Sections 24, 25, 19 and 30 at noon. This ridge has a sandy drift with a moderate number of boulders.

Mr. C. Helmer's well at northeast end of Manistique Lake is 70 feet deep and gets water in gravel. Aneroid 29.655 at well = 710 feet. It flows a weak stream and it is thought a stone is fast in lower end of pipe to choke it. It was made in 1902. It runs about 20 gallons in a half hour. It is piped into house so temperature is not known. Aneroid 29.620 at Manistique Lake at 1:15 p.m. = 700 feet ±. The well is on ground about 10 feet higher than the lake and the water flows into a tank in the house 5 feet higher yet and will rise considerably higher.

Aneroid 29.630 at Lake Manistique at 1:40 p.m. = 700 feet ±; 29.555 on hill 1/2 mile north = 780 feet ±. There are dunes along the north side of the outlet of Round Lake where it flows east in Section 20, T.45N., R.11W., and the drift is sandy north from there.

John Fyvie, in Section 17, has a well 58 feet deep that has head only 7 feet below surface. It is near south side of SW¼ Section 17. It is clay for 40 feet, then sandy gravel 8 feet and water below. Aneroid 29.560 at well. The higher land south is sandy but the clay is in the sags.

Aneroid 29.590 at swamp 80 rods north of this well where road turns east = 720 feet; 29.510 on hill in north part Section 17 = 780 feet ±. There is a gradual increase in altitude northward into Section 8. Aneroid 29.485 =

800-810 feet in south part of section. Boulders abound, some of them large, chiefly granite. The soil is loamy--a sandy rather than clay loam. Aneroid 29.470 = 820 feet ± at center Section 8 at crossroads at 2:00 p.m. About 1/4 mile north I leave the road and go northeast onto a very high hill, aneroid 29.380 = 900 feet ±. It is a conical hill that I had in view from southwest of Round Lake. The ridge and slopes are sandy and I see no definite beach line. Aneroid 29.440 at highest point in road 40 rods southwest of this hill.

Aneroid 29.450, 840 feet, at intersection with a southwest-northeast wagon road in south part Section 5; 29.470 at railroad spur 1/2 mile farther north-northeast = 825 feet ±. This is by a beach line or bank of gravelly sand and marks about the level of the water.

The road runs up into higher ground to the northeast, aneroid 29.435 about 80 rods from railroad spur. Aneroid 29.415 at a low sandy ridge 80 rods farther = 870 feet ±. This may be a higher beach. The road here turns north and drops down to base of a steep bluff, aneroid 29.480. Along the base of this is a beach line (aneroid 29.470), washed up in places into a ridge = 820 feet ±. Aneroid 29.510 on a clay terrace at south part of village of McMillan = 780 feet; 29.560 at McMillan station at 3:20 p.m. = 734 feet.

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