

Open File Report XXXV
FIELD NOTES OF FRANK LEVERETT

Notebook No. 203 - Leverett

COUNTY

Chippewa

Mackinac

OTHER STATES

Ontario

INDEX
NOTEBOOK NO. 203

(August 17, 1905 to August 27, 1905)

- August 17. Drive from Soo to Brimley and Iroquois and return with Mr. Beedle.
- August 18. Beach at Fort Brady. Trip Soo to Rudyard. Flows. Notes on boulders near Soo, by G. L. Tower.
- August 19. Flowing wells northeast of Rudyard. Moraine near Kinross and southeast nearly to Pickford. Several well records. Flows at Pickford.
- August 20. Well drillings at Pickford. Trip to Stalwart and west along rock escarpment and back to Pickford.
- August 21. Watson's flowing well at Pickford. Drive west and south across T.43N., R.1W., and back and west past Strongsville and north to Rudyard. Flowing wells south of Rudyard and south of Dryburg.
- August 22. Flowing wells west of Rudyard to Dryburg and Fibre and south of Rudyard. Wells near Strongsville that do not flow.
- August 23. Flows northeast of Rudyard. Trip Rudyard to Louis Brown's. A few wells.
- August 24. Trip Brown's to Hessel and return. Brown's to Rudyard via Pine River valley and Mackinac Road.
- August 25. Railroad trip Rudyard to Fibre. Walk to Palms. Railroad to Ozark. A few well records.
- August 26. Ozark to Trout Lake and Rudyard and Brimley to Wellsburg and return by rail to Sault Ste. Marie.
- August 27. Sunday. Levels at Fort Brady on Nipissing beach. Observations in Canadian Soo and west of there.
- August 28. Flows at Eckerman. | These data are in

Sept. 2. Flows at Emerson.

Sept. 4. Flows at Dollarville

Notebook 203, but the transcription has been included with that of Notebook 204.

August 17, 1905. 7:30 a.m.

At forks of road south of Sault Ste. Marie in north part Section 18, T.47N., R.1E., at altitude 720 feet, aneroid 29.605. I take Mackinac Road. Aneroid 29.605 at line Sections 13 and 24 near quarter post; 29.595 on knoll 80 rods south = 730 feet; 29.595 at line Sections 24 and 25, on clay ridge 10 feet ± high = 730 feet. Ridges west are 25-30 feet higher. The sharp gravelly ridge runs about 1/4 mile into NW¼ Section 25. This section is flat clay near corner Sections 25, 26, 35 and 36 along the west side of the north fork of Charlotte River.

Aneroid 29.615 at church 1/2 mile north of town line Sections 25 and 36 on a largely flat clay. There are some knolls in east part of Section 36. Aneroid 29.630 at town line at 8:00 a.m. = 680 feet ±; 29.655 at Charlotte River, north branch, on town line = 660 feet ±. take this line westward. Aneroid 29.630 on the ridge west of Charlotte River that has cobble under clay = 680 feet. Points in field north are 10 feet higher, or about 690 feet A.T. The country is flat along the Mackinac Road to Charlotte River 1¼ miles south of town line but is gently undulating just west of the road.

Aneroid 29.650 at edge of flat land just west of a frame church where a road runs north from town line 80 rods east of corner Sections 34 and 35 = 660 feet ±; 29.670 at west fork of Charlotte River on line Sections 3 and 34 = 650 feet ±. The ridge I left 3/4 mile east of here has a border trending north-northwest keeping about 1/2 mile from this branch of Charlotte River but parallel with it. Aneroid 29.690 = 635 feet on low ground under the railroad 20 feet or more below track. The track is 656 feet. This has a swampy flat 15 rods ± in width that runs south-southeast - north-northwest. It seems to be an old channel connected with Lake Nipissing, the altitude being about 635 feet A.T.--estimated from railroad elevation nearby. The Nipissing shore is less than a mile northwest from here. Streams farther west show a similar swampy bottom before opening into the Lake Nipissing flats. This is a clay plain until I reach the east part of Sections 5 and 32. There is a low ridge running north-south here 80 rods to 120 rods east of corners Sections 5, 6, 31 and 32, that is visible for a mile south of town line and runs north to the Nipissing bluff. Aneroid 29.670 on crest = 660 feet ±; 29.685 on flat tract west of it at corner Sections 5, 6, 31 and 32 by schoolhouse where a road runs south. There is a little sand on this flat land but clay sets in at slight depth.

Aneroid 29.720 at south branch of Waiska River on line Sections 6 and 31 at 8:45 a.m.; 29.680 on west bluff. There are sandy ridges capping the red clay between this stream and the main stream. West of the main stream I enter a sand covered plain on which the aneroid

reads 29.680 = 665 feet ±. The sand is 5-10 feet deep and covers a laminated red clay. This should have been flooded at time the Fort Brady beach was forming (see page 94 of this notebook). The sand rises to 700 feet farther west.

I make a rise westward to the railroad crossing. Aneroid 29.650 on railroad at 9:05 a.m. = 693 feet. There is a sandy ridge here that may be the summit on Soo Line 9.42 miles from Sault Ste. Marie. If so, it is 693 feet A.T., by aneroid, 680 feet A.T. Aneroid 29.665 on brow of Nipissing bluff about a mile west of railroad crossing = 680 feet; 29.680 at top of red clay; 29.690 at foot of bluff at 9:15 a.m. = 650 feet ±; 29.735 at lake level north of Brimley at 9:30 a.m. = 601 feet.

I continued westward, from Brimley with Mr. Beedle. Aneroid 29.680 at foot of Nipissing bluff. The bluff is laminated red clay with a thin capping of sand at top. Springs issue at base of sand. The bluffs are about 700 feet to top of clay and 720 feet ± on sandy ridges, the ridges being 10-20 feet.

About a mile west we reach a sandy tableland. Aneroid 29.500 at a dwelling on north side of road, probably in Section 35. There are occasional boulders in the sags. At forks of road we take right hand road leading nearly west and soon rise to a very flat tract. Aneroid 29.485 = 800-810 feet ±.

We go west on town line a mile to bluff. Aneroid 29.450 at base of bluff = 835 feet ±; 29.425 at top of bluff. This is an old shore line, probably the 860-foot shore. The timber above this shore line is largely hemlock and hardwood, while on the plain below, it is pine, (Norway and jack pine). This higher tract is gravelly and I see scarcely any boulders on it. Cobblestones, however, are numerous. Aneroid 29.410 at abandoned schoolhouse nearly a mile west of this beach, probably at corners Sections 28, 29, 32 and 33.

Aneroid 29.425 at southeast corner Section 30 at Mr. Van Luven's place. The well here is 16 feet deep and gets water in quicksand under gravelly. Boulders are numerous in Sections 30 and 31, especially small ones 6-12 inches in diameter.

Aneroid 29.400 on a beach line 20 rods east of town line on line Sections 30 and 1 = 370 to 875 feet A.T. by Lake Survey chart. It runs southwest into Section 36. It passes 40 rods south of center of NE¼ Section 36. About middle of line of Sections 25 and 36 we descend a steep bluff to the 780-foot beach. Aneroid 29.525. A little farther, or about 80 rods from west end of line, is another beach. Aneroid 29.565 = 750 feet.

Aneroid 29.600 at corner Sections 35, 36, 25 and 26, at southeast edge of a plain = 710 feet ±; 29.630 at edge of swamp about 80 rods west. We go west to about middle of line and then south. Aneroid 29.640 at stream 80 rods south = 670 feet. An ascent begins here. Aneroid 29.600 on fresh beach south of here; 29.610 at noon at place in east part Section 35, T.47N. R.4W., where we stop for dinner at Mr. De Merse, in northwest part

Section 35. The beach near corner Sections 30 and 31, T.47N., R.3W., and Sections 25 and 36, T.47N., R.4W., is above the 860-foot contour 10-15 feet, or 870-875 feet. See Lake Survey chart.

Aneroid 29.650 at Pendill's Lake at 12:45 p.m. = 650 feet ±. The land on north side of the lake is a succession of sand ridges and bayous of the Lake Nipissing series. The south edge of swamp is 8-10 feet higher. Aneroid 29.635. The land south of this swamp--Section 35--is a bouldery till with good clay loam soil. Aneroid 29.600 at Mr. A. De Merse = 700 feet ±. At 2:00 p.m., aneroid 29.580 = 700 feet ±.

We go west to see the hills and gulches in Section 34, said to be highest land in vicinity, but do not find anything above 800 feet A.T. in central and north parts of the section. It is largely clay land with a few boulders. Aneroid 29.560 at Mr. De Merse's at 3:10 p.m. = 700 feet ±. The land seems to rise gradually south from here for 1/2 mile or more. Aneroid 29.600 at swamp in north part Section 35 at Nipissing beach; 29.350 on a fine beach 1/4 Mile west of town lines 29.340 at town line, 1/2 mile south of Iroquois post office = 860 feet by lake Survey chart; 29.330 about 80 rods north = 870 feet. A beach sets in here and runs northeast. About 40 rods north is one 20 feet lower, aneroid 29.350 = 850 feet. About 40 rods farther, or near quarter posts is another, aneroid 29.400 = 810 feet ±. This also runs southwest to northeast. It has a steep slope on northwest base. Aneroid 29.460 at base of steep slope = 750 feet ±.

Aneroid 29.475 at schoolhouse at corner Sections 19 and 30, 24 and 25; 29.500 at edge of swamp 20-30 rods north of schoolhouse. This has clay bottom. Above this, the slope up to the high country on south is all sandy or gravelly. I am told the boulders and hardwood extend 1/2 mile south of the township corners. There is a low till ridge strewn with boulders north of this swampy tract. Aneroid 29.490 at top; 29.555 at swamp at north base of this till ridge = 635 feet ±. The Nipissing beach is a fine sand (red) standing 10 feet ± above the swamp south of it, or about 645 feet.

Aneroid 29.530 on top of clay bluff near Dollar Settlement s 655 feet ±. We take road east through center of T.47N., R.3W. Aneroid 29.440, 730 feet, at foot of cut bluff about a mile east of town line; 29.380 at beach on top of bluff where road swings to a little north of section line = 790 feet ±; 29.365 at another beach 20-30 rods back of the last one = 800 feet; 29.330 at foot of ascent to a high beach = 835 feet. This platform is bouldery, but those below it are gravelly. Aneroid 29.300 on the beach = 865 feet about where the road comes back onto the section line. From here east is a gravel plain strewn with boulders. Aneroid 29.270 at top of a bluff facing east that is perhaps 1/2 mile east of center of township = 920 feet; 29.310 at base = 880 feet. The boulders are plentiful within 1/2 mile west of this bluff.

I go north and find that the Iroquois Lake Survey Station is on a belt of dunes. The dunes are generally low, but a

little strip gets to considerable height. Aneroid 29.380 on bluff west of Spectacle Lake = 820 feet. The bluff where road descends is a fine sand clear to bottom. Aneroid 29.570 at Nipissing shore = 650 feet; 29.580 on general level of plain in front of beach = 640 feet; 29.550 at Brimley Station = 666 feet. Nipissing shore is about 648 feet by hand level.

August 18, 1905.

There is a cut bluff at Fort Brady about 16 to 17 feet lower than base of stand pipe. There are boulders scattered over it but not so numerous as at the base of the main Nipissing bluff. The clay under this Fort Brady terrace is laminated where poles have been sunk along south edge of the Fort grounds and seems to be pebbleless, but there is a slightly pebbly till piled along the roadside south of the Fort. The cut bank swings around to the west of the stand pipe and runs southwest to the recess shown on chart. It is only 20 rods north and west of stand pipe to it. The stand pipe is about 716 feet, according to city engineer, so the highest cut bank is about 700 feet at base. (notes August 27).

I take train to Rudyard at 5:12 p.m. Aneroid 29.365 at Sault Ste. Marie, 615 feet; 29.350 at mile post 2 = 645 feet A.T.; 29.335 at mile post 3 where cleared land sets in. The aneroid shows very little change for 2 miles or more, being 29.325 at town line on bridge = 656 feet. An ascent begins 2 miles north of Dafter at 672 feet. Aneroid 29.290 one mile north of Dafter = 697 feet; 29.300 at Dafter, 691.6 feet A.T. The knoll in northwest part of Section 4 is 15 feet ± high where east-west road crosses.

Aneroid. 29.270 at Cottage Park = 731.6 feet. The surface is gently undulating with occasional boulders in a small tract south of this station, but most of the land is swampy for 2 or 3 miles, as in the tract crossed by the Mackinac Road (see notes August 11). The land here is sandy wherever there is a slight rise of ground.

Aneroid 29.250 at Kinross in a cut 15 feet deep = 754 feet ±. There is only a little land here above swamp level. The swamp 1/2 mile east is 10 feet lower than the station. About a mile beyond Kinross a descent begins and aneroid reads 29.300 at the first stream--tributary to Munuscong River = 700 feet. Sandy land seems to stop at this stream or just east of it. Aneroid 29.260 on divide between Munuscong and Pine River drainage on a clay plain = 729.3 feet.

Aneroid 29.300 at Rudyard at 6:00 p.m. on train = 685 feet; 29.310 outside of train at 6:00 p.m. = 685 feet. The 2-inch flowing well of Mrs. Rachel Dawson at the hotel has a temperature of 47½ degrees, but it flows so weak a stream that it is likely to be heated by surface temperature. Rate of flow 1 quart in 1¼ minutes at level of surface.

John Anderson's 3-inch well in lot north about 200 feet distant has a flow of a quart in 1 minute, 13 seconds. This has a temperature of 52 degrees, being warmed up

by exposure of pipe several feet above the surface. It discharges 3 feet above surface. Depth, 285 feet. It has a head 22 feet above surface. Made in October 1904. Altitude, 682 feet. James Somerville, of Newberry, driller. Red clay, 240 feet. There was some black slush with the quicksand under the clay. It stopped in fine gravel. the level of both wells is 2-3 feet below the track at depot, or about 682 feet.

J. C. Sass has a well 1½ miles up the railroad, east of Rudyard, only 28 feet deep that struck a pebbly material near bottom. The water stands 6 feet below surface. It is on ground 30-35 feet or more above Rudyard = 715-720 feet. The well is 3-inch and will stand pumping 2 barrels in 7 minutes. Made in June, 1905.

William Bunker has a well near Mr. Sass, 42 feet deep with similar head. Made in June, 1905. Made by owner.

John Bergman has a well on north side track, 28 feet deep, with similar head. This well has clear water, but Mr. Sass's and Mr. Bunker's wells are roily with a whitish sediment. Made in 1905.

Mr. Doltman, who lives 1/2 mile farther east, drilled all these wells. He has a flowing well 72 feet deep, but it is on ground only 700 feet A.T.

Notes by G. L. Tower on boulders along Nipissing bluff southeast from Sault Ste. Marie, beginning at Ashman Street:

"From point below stand pipe to point 1, boulders in quantity. Sudden absence after passing point. At entrance to woods one lone boulder seen, then absent again for some distance. At point 4, rocks very large and numerous, continuing to within 500 rods of Seymour road. At this point, rocks again disappear. At 800 yards past road, enter swamp. Rocks appear covered with moss and continue to crossing with town line road. All through woods, after crossing town line road to Shunk Road, ground covered with rocks. Between Shunk and town line roads also. At point where shore line doubles over Cross Line road, the rocks are very large and numerous."

H. H. Wyatt has a flowing well on south side railroad track in SW¼ Section 5, T.44N., R.2W. Depth, 104 feet. Made by James Somerville. Diameter, 3-inch. Flows 10 barrels a day. Head, 4 feet above surface. Altitude, 700 feet ±.

August 19, 1905. 7:50 a.m.

Aneroid 29.200 at Rudyard Station = 685 feet. I go east 1/2 mile to section line east side of Section 6, T.44N., R.2W., to Hugh Boncor's flowing well on south side of road. Aneroid 29.195 or about 5 feet above station. It is 268 feet deep and flows a quart in about 3 minutes at 3 feet above surface. It is a 2-inch pipe with 1-inch reducer. Temperature 50.7 degrees F. It was drilled by Mr. Lawlor of Rudyard. Made in 1904.

I take road north between Sections 5 and 6, across railroad, aneroid 29.290. Henry Cottle has a well about 50 rods north of railroad in Section 5 that flows a strong stream from 4½-inch pipe, part being carried to the house and part runs to waste. Temperature 45.8 degrees. That to mill cools gasoline engine. Depth, 125 feet. Red clay with some pebbles, 90 feet. Quicksand of dark color--blue-gray, to gravel at bottom. Well was made in 1901 by Mr. Cottle. It has strong flow, 8 feet above surface, of over a barrel a minute. It is soft water and does not color glassware. The well is 36 rods east of road. The railroad rises 18 feet per mile here from Rudyard east, so this is about 12 feet above Rudyard, or 697 feet A.T.

William Cottle drilled a well 550 feet west of this well, 233 feet, and got a weak flow that would rise 12 feet above surface and only flowed about 2 pails in 24 hours. Another close by it was drilled to same depth with same results. Another boring, 135 feet, nearby, struck some hard material and was abandoned.

Another, about 70 rods east of this strong flow Mr. Cottle made a flowing well 84 feet that penetrated red clay 60 feet, quicksand 22 feet, and clean gravel 2 feet. This had a strong flow 5 feet above surface, it was stopped and pipe pulled. This was made in 1895.

Mr. Benjamin Weissing has a well about 60 rods south of northeast corner Section 6, 190 feet deep, made in 1904. It was drilled by Mr. Lawlor. This was a second attempt; the first boring struck something hard at 190 feet. It penetrated red clay 140 feet; balance was sand to the crust at bottom. It is of bluish color with an occasional small stone. It flows over top of pipe 5 feet above. The altitude is similar to Mr. Cottle's well. It flows a quart a minute. Temperature, 55 degrees. Evidently warmed by soil and air.

John Kauper has a well in southwest part of Section 32 that flows into a basin 5 feet deep and stands near ground surface. Well is 100 feet deep and 1-inch pipe which he drove himself. He drove a 2-inch hole and then put in an inch pipe with a screen. It flows only about 10 pails in 24 hours. It was red clay 80 feet, hard 45 feet, and then a lighter clay and softer 35 feet; then gray quicksand. Temperature, 55 degrees in basin.

Another well, 20 rods east, is 90 feet deep that freezes when in a small pipe, and so did the one at the house. There was coarse sand at both. These are 40 rods north of section line.

George Kamper has a well just made about 120 rods north of southwest corner of Section 32 that is now down 90 feet that strikes gravel at this depth. Diameter of well, 2-inch. There was sand from 70 to 90 feet that is quite calcareous. The red clay from 40 feet deep is also strongly calcareous and contains small pebbles. The red clay is calcareous at depth of only 12 inches from surface. There are occasional surface boulders here. Temperature, 50 degrees F.

L. A. Holbert, in southeast part of NE¼ Section 31, has a flowing well 118 feet that will rise 8 feet or more above surface. It penetrated red clay 85 feet and there was quicksand to 110 feet and then gravel 8 feet. There was stuff like coal at about 105-106 feet. Slight iron stain. It flowed about 1 quart a minute, 2-inch pipe. Well was made in July, 1905. Present flow, 200 gallons a day.

Mr. Garrett Dolman has a flow that will stop when a large flow east of it 40 rods is allowed to run full force. This is near middle of town line between Townships 44 and 45 North, R.2W. (see notes August 23).

I go north on line of Sections 31 and 32. Aneroid 29.150 at corner Sections 29, 30, 31 and 32 at 10:00 a.m.

There is a small gravelly terrace a little west of the middle of line of Sections 29 and 32 about 15 feet high. The southwest part of the township has a red clay soil and is flat enough to be swampy. Aneroid 29.130 at south border of moraine on line Sections 19 and 20, T.45N., R.2W., near south end. This is a hardwood belt. The land for 1/2-3/4 mile south shows some sandy spots. Aneroid 29.085 on top of ridge. There is sandy material here and shallow basins occur on it. Within 1/4 mile north, or not far from middle of line Sections 19 and 20, boulders set in.

Aneroid 29.060 at place where road turns east on south side of a clearing. This clearing is 120 rods or more north on gently undulating land with boulders on it. The hardwood extends still farther north. Aneroid 29.110 in swamp north of the hardwood belt in Section 9 near south line. The highest points are 60 feet higher than this swamp in NW¼ Section 16. There is a lake and huckleberry marsh covering much of Section 16 except west and north borders. Aneroid 29.100 on this marsh south of the moraine. The width here is scarcely 1/2 mile across the moraine but west of here in Sections 17 and 20 it is nearly 2 miles wide. The width is a little more than 1/2 mile at line of Sections 15 and 16. I am told by a man living in Section 15 that the swamp is sandy for only about a mile north of the moraine in Sections 9 and 10. Farther north it is principally a flat clay country to Brimley. The moraine has considerable sand in which cobble and boulders occur. Its relief is abrupt on the south border in Sections 16, 15 and 22.

Aneroid 29.070 at Kinross at noon = 754 feet. The moraine here is almost entirely sand with scarcely any boulders or gravelly material. Aneroid 29.045 on crest of moraine just north of Kinross. There is a lake and swamp within 1/2 mile northeast of the Station and flat land as far as I can see in that direction. Aneroid 29.060 at summit at Mile Post 476 = 754 feet. There is a ridge a mile east of here extending north on east side of the little lake. There is a sandy knoll cut by railway 1/2 mile northeast of Mile Post 476.

The postmaster at Kinross has a well 26 feet deep that terminates in gravel. This is about as deep as any in this village. Aneroid 29.060 at Kinross at 1:00 p.m. = 754 feet ±. We continue east along the moraine, passing on north side of a lake in Section 25. Aneroid 29.010 at W.

C. Bogart's in NW¼ Section 30, T.45N., R.1E., on top of moraine = 800 feet. This has a flat top here nearly a mile wide.

Aneroid 29.010 at Mr. S. Sparks in southeast (?) part Section 25, T.45N., R.2W., on south edge of the tableland = 800 feet. The well here is 57 feet. It is entirely sand; yellow, for 25 feet, and then bluish colored sand with no stones in it. The water is struck in fine sand. Water does not rise any in well. The water is 55 feet from surface and this is about level with the swamp south of here. The temperature is 45 degrees F. It is 3 by 4 feet and curbed with plank.

The northeast half of Section 25 is on this tableland and nearly all of Section 31, only the southwest edge being in the swamp. The border then runs southward about to center Section 7, T.44N., R.1W. Only small stones on this tableland along line of T.44N., Ranges 1 and 2 West. Aneroid 29.070 at lake by the geodetic station in Section 28, T.45N., R.1W.; 29.000 at geodetic (U. S. Lake Survey) station north part Section 33, at 2:30 p.m. = 800 feet ±; 28.895 at top of tower. This shows a high ridge running fully 2 miles slightly west of south. The water table is probably as low as this lake.

At a farm house 1/4 mile east of the Lake Survey Station, the well is 78 feet deep and has only 1½ feet of water. There is not over a foot variation. The lake varies about 1 foot in level.

A well 1/2 mile north. in Section 28, on east side, is 76 feet. It is on lower land. It is on land that Jackson Fletcher owned but has not kept taxes paid, so it has reverted to State tax land. Aneroid 28.985 at Mr. Wilson's well.

Aneroid 28.985 at middle of line Sections 33 and 34 where road turns southeast. The road soon comes to a narrow gravelly ridge that seems likely to be a beach. Aneroid 28.975 on crest. It is in central part of NW¼ SW¼ Section 34. I follow it about 3/4 mile southeast. It winds somewhat and is very bouldery in places on the crest and north side. The wave action was chiefly from the north. South of the ridge there are gentle undulations as if very little wave action had occurred. There was Norway pine on this tableland from where this beach sets in southeastward for two miles or more. There are occasional boulders and the surface is gently undulating though the highest swells are only 10-15 feet. Aneroid 29.070 at a beach. On the bluff west of here 40 rods is an island-like knoll cut into on its east face. If this is a beach it is 30 feet ± higher than the one just under the bluff. The high land covers the west tier of 40's in Section 11.

Mr. Philip Kibble, who lives in southeast part of Section 10, says there was a well made in north part Section 10 that was 53 feet and had only a foot or two of water. Sand the entire depth. At his place below the bluff is a well only 5 feet deep.

The bluff runs northwestward from here, crossing into Section 9 about 80 rods south of the corner of Sections

3, 4, 9 and 10 and then west a mile, then west-southwest to center of Section 7. The sandy land south of the bluff is ½-1 mile wide and has a definite sandy ridge on south edge, south of which is the clay land. The sand ridge runs a little north of the center of Sections 13, 14, 15, 16, 17 and 18. South of it is the lake clay tract that extends to the Niagara escarpment in T.43N., Ranges 1 East and 1 West. Aneroid 29.070 at Mr. Kibble's at 4:00 p.m. = 730 feet ±.

About 1/4 mile east of corner of Sections 10, 11, 14 and 15, there is a drop to a flat plain, aneroid 29.090. A narrow ridge with boulders runs east into north edge of Section 14. North of it is a sandy swamp with tamarac covering much of Section 11. Boulders are numerous in Section 12 and north part of Section 13 on a sandy plain. Aneroid 29.115 at Meridian Road, 4 miles north of Pickford at 4:30 p.m. = 675 feet; 29.115 at brow of Nipissing bluff, 40 rods west of corners Sections 7, 8, 17 and 18. The land is bouldery as far east as this bluff. Aneroid 29.140 at base of Nipissing bluff = 650 feet. The plain below the bluff is not boulder strewn. The swamp nearly covers the NE¼ Section 1, but only the eastern edge of the SE¼.

Aneroid 29.110 at Meridian Road at 5:00 p.m., 4 miles north of Pickford, = 675 feet; 29.110 at sand ridge by church 3½ miles north of Pickford = 675 feet; 29.130 at foot of slope about 80 rods south of the church = 655 feet; 29.140 at corner Sections 18, 19, 13 and 24; 29.150 at cross roads 1 mile north of Pickford; 29.160 on plain in northwest part of Pickford = 640-645 feet; 29.175 at level of flowing wells at hotel and business part of village at 5:50 p.m. = 630 feet ± A.T.

Mr. Oakman S. Roe has a flowing well with temperature of 45.8 degrees when pumped vigorously. It is piped from house to a barrel on side hill at level 7 feet lower and there flows a 3/4-inch stream. The head is 6 feet higher than the well mouth, or fully as high as the ground at the hotel.

John Stanley has a flowing well at Chippewa House in Pickford, 126 feet; diameter, 4-inch. Made about 18.95 by Isaac McKee. It would rise when first made 2 or 3 feet above surface and flow an inch pipe full. It now discharges into an 18-foot dug well and is pumped.

Mr. Stanley says the greater part of Section 6, T.44N., R.1E., is ridgy land above the Nipissing level and so is Section 31 of T.45N., R.1E. There are sandy ridges in the southwest part of T.45N., R.1E., along the Nipissing shore with clay flats between. The plain below the Nipissing, in northwest part of T.44N., R.1E., is red clay. The sandy land north of Munuscong is mainly east of Little Munuscong River and below the Nipissing shore line.

August 20, 1905. 8:00 a.m.

Aneroid 29.350 at Pickford. Altitude 630 feet ±. I get a sample of drillings or pebbles from bottom of Dr. D. H.

Webster's flowing well at Pickford. Aneroid 29.350 on plain east of Pickford at 8:20 a.m. = 640 feet.

Aneroid 29.375 at Bacon's flowing well. This well just drips--not strong enough to show temperature. Aneroid 29.400 at east fork Munuscong River at 8:35 a.m. = 600 feet ±. I took temperature of a shallow pumped well west of the Bacon well; depth, 13 feet. Temperature 46-3/4 degrees by pumping.

We take read south between Sections 5 and 6, 7 and 8 through the plain of red clay. This probably has scarcely any rise in the two wells. The aneroid reads 29.375 at corner Sections 7, 8, 17 and 18 at 9:15 a.m., showing a weather change to higher barometer. Aneroid 29.405 at Munuscong River on line Sections 8 and 17 = 615 feet ± at 9:20 a.m.

Wells are obtained at 20-25 feet depth in this vicinity. No deep borings for flowing wells have been made. Aneroid 29.370 at corner Sections 8, 9, 16 and 17 at 9:35 a.m. = 645 feet ±; 29.365 at Nipissing bluff at base, on line Sections 20 and 21, T.43N., R.1E., at 10:10 a.m. This runs about 120 rods north of section corners and bears about east across Section 21. Aneroid 29.330 = 675 feet at section corners 20, 21, 29 and 28. This is on a boulder strewn, knoll with clay loam soil. Section 29 is all above the Nipissing beach except perhaps the northwest corner. Limestone blocks are numerous among the boulders on line of Sections 21 and 28. Aneroid 29.325 at corners Sections 21, 22, 27 and 28 at 10:50 a.m.

Aneroid 29.330 at Mr. McGinnis, near middle of south side Section 22; 29.365 at swamp 80 rods from east end of line Sections 22 and 27; 29.390 at creek near corner Sections 22, 23, 26 and 27 at 11:15 a.m., probably 640 feet A.T.; 29.380 at corner Sections 23, 24, 25 and 26 at 11:40 a.m. The Nipissing shore crosses the northwest part of Section 25 in a southwest-northeast course. Nearly all of Section 26 is below it. Aneroid 29.310, 700 feet ± on rubble beach on town line, 40 rods north of corners Sections 24, 25, 19 and 30. It is a narrow ridge only 2 rods wide and limestone immediately underlies it.

Aneroid 29.310 at dwelling back of Stalwart Post Office at 12:30 p.m. where we stop for dinner. Altitude 700 feet ±. I am told that all the limestone there is in this township is in Sections 19, 30, 31, 35 and 36. The well at this place back of Post Office is 72 feet and has 20 feet of water in it. Water was struck in a hard redrock at 69 feet and water obtained in it. Made in 1899; 4-inch well. Other wells north of here 1/2 mile are of similar depth.

James Duncan, in southeast corner Section 36, made a well 60 feet deep and the water rises nearly to top of well. It was in limestone and on elevated land, about 700 feet A.T.

Richard Harwick, in northeast part Section 35, has a well 60 feet that has head near top. This is on lower land than at Stalwart Post Office. There seems to be higher

land a mile south of Duncan's in south part of Section 1, T.42N., R.1E.

There is a sandy, swampy tract along Munuscong River from near its source northwest to about opposite Stalwart. It there becomes clayey. Probably Lake Nipissing extended up to this plain where sand sets in. The morainic tract that runs from Stirlingville southeastward is reported to be sandy and have only a few boulders in T.43N., R.2E., there being fewer than in T.43N., R.1E., and T.44N., R.1E. This is 1-1/2 miles wide. It seems to follow up the northeast side of Munuscong River about to the head of the stream and there run into limestone hills that extend for 2 miles northwest of Galesville eastward to Raber. Aneroid 29.310 at dwelling back of Stalwart Post Office at 1:30 p.m. = 700 feet ±.

Aneroid 29.340, 675 feet, at section corners 3/4 mile south at 2:00 p.m. This is on a swampy flat that runs east some distance, 1/2 mile ±. The greater part of SE 1/4 Section 25, NE 1/4 Section 36, and NW 1/4 Section 31 are wet land with a few low swells 10 feet ± in height. It has a clay soil and is free from boulders. The higher land on its borders is thickly strewn with boulders and with limestone blocks. Aneroid 29.300, 700 to 720 feet, at a beach on east slope of a hill 120 rods from east end of line Sections 26 and 36. It runs northwest to about middle of line Sections 25 and 26 and then returns south into Section 35 before continuing west. There are also bars of gravel on the crest of this ridge, aneroid 29.290. One runs south into Section 36; another northwest in southwest 40 of Section 25 (see map).

Aneroid 29.300 at section corners 25, 26, 35 and 36 at 2:30 p.m. The beach is just west about 6 rods at same level. Aneroid 29.350 at bluff of creek near middle of line Sections 26 and 35 = 650 feet ±. The red clay extends only 40-50 rods east of this creek. Farther east is stony land, gently undulating. It is flat on north edge of NW 1/4 Section 35 and west half and NE 1/4 Section 26. Aneroid 29.340 at corner Sections 26, 27, 34 and 35 at 3:00 p.m. near west edge of clay flat.

Near middle of line Sections 27 and 34, I reach a flat tableland, 740 feet ±, aneroid 29.250, on which there are a few boulders. I saw no limestone outcrops on the slope. About 40 rods west on a gradual ascent, I come to limestone at surface, aneroid 29.230. I then rise over ledges rapidly to where aneroid reads 29.200 = 800 feet ± A.T. These are swept bare of earth over patches several square rods in a place. About 60 rods south of this line is a limestone escarpment on which aneroid reads 29.150 = 840 feet ±. It has a cliff 15 feet high and north of this, several 5-6 feet high. There is some gravel amongst the lower ones and between them I saw some on section line where aneroid read 29.185 where a slight descent to west sets in. This may be the upper Algonquin beach. The ledges are swept clean on highest points, however, as if they might have been wave washed.

I return to the line and continue west, descending to a well defined, shore in about 1/2 mile. Aneroid 29.270 at 4:00 p.m.; 29.350 at creek in cedar swamp at 4:20 p.m. = 660 feet; 29.120, 860 feet ±, on gravelly ridge about a mile east of the Meridian = 860 feet, which is north of corners of Sections 29, 30, 31 and 32. It bears west-southwest to the Meridian at corner of Sections 25 and 36, 30 and 31. Aneroid 29.130 at Meridian on the beach = 850 to 860 feet. There is a lot of coarse gravel and cobble here. The land drops off rapidly to the west on line of Sections 25 and 36. Aneroid 29.200 at foot of steep bluff = 300 feet; 29.200 at corner Sections 25, 26, 35 and 36; 29.150 on gravelly ridge 40 rods south = 850 feet. This runs slightly north of west to corner of Sections 26, 27, 34 and 35. There is no higher land in view south of here. This is a drift filled tract in west part of Section 36 and in Section 35. The limestone ridge covers the east half of Section 36 and southeast part of Section 25. There is said to be high land, 989 feet, by the Robinson Lake Survey Station, near corner Sections 34 and 35, 3 and 4--about as high as any in this region.

Aneroid 29.100 at Meridian at 6:40 p.m. where it read 29.130 an hour ago = 860 feet ±; 29.200 at corner Sections 19 and 30 = 780 feet; 29.250, 735 feet, at foot of steep descent about 100 rods north of corner; 29.300, 670 feet, at foot of gradual slope at quarter post of Sections 19 and 24. There is a bank here 10-12 feet high that seems likely to be the Fort Brady bluff. It runs east 80 rods and then north about 100 rods before turning east again. This corresponds to fort Brady. The main Nipissing is 1/2 mile farther north near a schoolhouse. Aneroid 29.330 at base of bluff = 640 feet ±; 29.340 at north edge of the swamp, about middle of line Sections 13 and 18; 29.340 at corner Sections 12, 13, 7 and 18; 29.365 at Munuscong River, 1 mile south of Pickford = 615 feet ±; aneroid 29.350 at Pickford = 630 feet ±.

Mr. Daley made a well for E. Cottle in north part of Section 5, T.43N., R.1W., 104 feet, that went 18 feet into gravel. Head is 30 feet. This is mainly in sand to the gravel. The Lake Survey Station on Morley farm is near center of NE¼ Section 3, T.42N., R.1W.

There is a strip of hardwood along the south side of Munuscong Bay along the line of Townships 43 and 44 North, and north to the Points (Maple Point, Rocky Point, etc.). The soil is a good loamy soil of fine quality for farming and is partly under cultivation. It is said to be free from boulders. South from this to the Nipissing shore there is a swamp that is unsettled, and no roads in it except one northward, from Raber to the mouth of Gogomain River where there are people living.

August 21, 1905. 6:00 a.m.

Aneroid 29.265 at Pickford = 630 feet ± A.T.; 29.265 at 6:45 a.m. Isaac Watson's flowing well flows 2 quarts a minute at 1 foot above surface. It is about 5 feet below the plain that the hotel is on or 625 feet ± A.T.

Temperature 46 degrees F. Air temperature 70 degrees F. at 7:00 a.m.

The streams in this region have a very narrow trench in a broader valley that is very shallow, the banks of the broader valley being only 6 to 10 feet high, while those of the inner valley are 15-25 feet. The shallow, broader valley excavation seems likely to be connected with the 620-foot beach which is several miles northeast of Pickford. Aneroid 29.240 at cross roads 1 mile west of Pickford = 640 feet ±; 29.235 on sand ridge 1¼ miles west of Pickford = 645 feet ±; 29.225 2 miles west of Pickford on clay plain--very flat--north for over a mile. No boulders on the plain here. There are a few just below the sandy ridge a mile east of here.

Aneroid 29.225 at cross roads 3 miles west of Pickford = 650-655 feet. We can see the sand ridge crossing the town line 1/2-3/4 mile west. About 1/2 mile south of this corner, on line of Sections 3 and 4, T.43N., R.1W., is a clay knoll with scattered cobble on it. Aneroid 29.200 on top; 29.215 at south base. There is a gravelly knoll 100 rods west of this. About 60 rods east-northeast is a sandy knoll. Around these knolls is a stiff, red clay.

There is a sandy gravel knoll about 120 rods east of this line on Fred Wise's land in north part of SW¼ Section 3. Mr. Wise lives on south side of SW¼ and has a well 65 feet deep with head 15 to 20 feet. It was dug 28 feet and bored with 18-inch auger. It was in red clay with bluish streaks. There was a sandy slush in lower 10 feet. Aneroid 29.220 at corner Sections 3, 4, 9 and 10 at 8:15 a.m. = 650 feet ±. About same altitude as Wise's well. A flow was obtained here at 112 feet later in season. (Daly notes).

Aneroid 29.260 at Munuscong River on line Sections 9 and 10 = 625 feet ±; 29.230 on south bluff; 29.225 at base of Nipissing bluff 1/2 mile south of Munuscong River on line Sections 9 and 10 = 645 feet at 8:30 a.m., 29.210 = 660 feet on bluff. This is strewn with limestone blocks and with boulders of all sorts. Aneroid 29.170 about middle of line Sections 15 and 16 on gravelly beach = 700 feet ±

Aneroid 29.155 on flat topped tableland north of Taylor's Creek = 775 feet ±; 29.200 on swamp bordering Taylor's Creek = 700 feet ±; 29.215 at sandy ridges = 660 feet ±; 29.215 on bluff of Taylor's Creek; 29.230 at creek at 9:25 a.m.; 29.200 on sand ridge 1/4 mile south, = 700 feet ±. Boulders set in south of this. Aneroid 29.150 at foot of steeper ascent about 1/2 mile south of creek; 29.110 at top of steep ascent 30 rods farther south = 790 feet.

Aneroid 29.075 at sandy beach 3/8 mile north of corners of Sections 27, 28, 33 and 34. Beach runs least-west = 815 feet ±. Aneroid 29.070 on sandy beach at south border of a swamp at 1/8 mile north of section corners = 815-820 feet; 29.045 at sandy, gravel beach at corners of sections = 845 feet. Is this the same beach that is just south of section corners 2 miles east as noted last night? It here trends west-southwest into Section 33. I can see higher ground in Section 3. T.42N., R.1W., with

hardwood timber on it. This is where the Lake Survey Station stood. I can see 1/2 mile south on line of Sections 33 and 34 and the land is flat in that direction. It also descends westward so this beach I am on seems to be the highest one on this north-south line, but it is 40-50 feet lower than the high beach 5 miles south of Pickford. (See later notes as to higher land south of the township line, August 24).

J. C. Brown has a well 25 feet on slope of this high ridge. Joseph Smith, northwest corner Section 34, has a well on the same beach. It was dug 90 feet and bored to over 100 feet. Water does not rise much in it. The drift is a heavy deposit, extending south across Sections 3 and 4 in T.42N., R.1W. The limestone there sets in that extends south to the shore of Lake Huron. There is no limestone on the ridge where the Lake Survey Station stood but I do not learn of any gravel ridge there. It is said to be a loamy soil and a lot of boulders.

We return north on same trail. Aneroid 29.075 at sand ridge 120 rods north of section corners at 10:20 a.m. = 780-790 feet; 29.150 at foot of steep slope; 29.200 at sand ridge 1/4 mile south of Taylor's Creek = 700 feet ±; 29.230 at Taylor's Creek at 10.30 a.m. There are boulders on the swamp north of the creek and clay at slight depths 29.215 on sandy ridges 1/4 mile north of creek = 700 feet. About 1/2 mile north of creek is a small tributary, now dry. Aneroid 29.230 in its bed; 29.220 at base of steep hill north of Taylor's Creek near center of T.43N., R.1W., = 655 feet; 29.150 at top of steep ascent 40 rods north at 11:00 a.m.= 750 feet; 29.200 on a gravel beach at south side of peaty bog 1/4 mile farther north = 695 feet wide; 29.220 in the bog m 675 feet; 29.190 on stony tract north of bog; 29.230 where road leads west at southeast corner Section 9 = 675 feet wide; 29.165 at Mr. Leach's at south side Section 9 = 730 feet ±.

The east edge of the limestone runs south from Section 9 across east part Section 16 and east of center of Section 21 and strikes across Taylor's Creek within a mile west from where we crossed and continues south across the town line, passing a mile west from where I interviewed Mr. Brown at corner Sections 27, 28, 33 and 34. There is continuous limestone on from there to Hessel.

Mr. Leach has no well but draws water from a spring 1/2 mile east of here. This spring issues from the limestone into a bog in northeast corner Section 16. There is a gravel beach at Mr. Leach's that runs north 1/4 mile and then swings west around base of limestone bluff. From Mr. Leach's, it runs southeast about to the line of Sections 15 and 16 and then southwest to edge of limestone and follows that south. There is not much increase in altitude for 2 miles west from here. Aneroid 29.165 at Mr. Leach's at 12:40 p.m. = 730 feet; 29.220 at southeast corner Section 9 = 775 feet; 29.260, 645 feet ± at base of Nipissing bluff about 50 rods north of section corners 29.270 at middle of township line at 1:15 p.m. where it read 29.225 at 8:00 a.m. = 650 feet ±;

29.250 at cross roads 4 miles west of Pickford on clay plain, 670 feet ±.

There is a strip of sand in northeast part Section 5 that runs across road into Section 32. Mr. James Cottle has a well in south part Section 32 with plenty of water at 24 feet. Mr. Cottle says a low, gravelly ridge runs across the north part of Section 32 to the northwest corner. There is also some gravel in north part of NE 1/4 Section 5 that runs east into Section 4. The gravel is a low ridge 5-20 feet high that is boulder strewn. There are also boulders on the sandy ridge that runs through north part of Section 5 and northeast part of Section 6. This, in places, looks a little like an eskers but is rather more irregular. It is 5-15 feet high and the aneroid reads 29.235 on it where it crosses the line of Sections 5 and 6. There is a little red clay capping it in places.

Aneroid 29.240 at corner Sections 5 and 6, 31 and 32 at 2:00 p.m. = 675 feet; 29.235 at town corners 6 miles west of Pickford = 615 feet ±. There is a thin sandy capping here. Aneroid 29.285 at Munuscong River bridge, 6-8 feet above water. This is 120 rods ± west of the township corners.

We turn south 1 mile west of town corners. Aneroid 29.240 where we turn; 29.190, 720 feet, on beach about 1 mile south on edge of the hardwood; 29.165 on a higher beach at an abandoned house in northeast corner of Section 11, about 30 rods south of section corners = 740-750 feet; 29.120 on a high point in the limestone 1/4 mile south of the section corners; 29.100 on ridge or at top of steep ascent near middle of line Sections 11 and 12 at 3.00 p.m.

A little farther south is a beach at north edge of a clearing in Section 11 on which aneroid reads 29.090, 815 feet ±. Boulders are more numerous on this tableland than the limestone slabs--mainly granite--1-3 feet in diameter; 29.080 at log shanty in Section 11 probably 80 rods from southeast corner, 150 paces from south edge of clearing = 825 feet ±. We return from the log shanty 266 paces to beach near north edge of clearing s 815 feet ±. At 370 is another beach, 805 feet ±, aneroid 29.100. Another, 500 paces to foot of stony ridge with limestone bluff, aneroid 29.130 = 780 feet; 695 paces to ridge of gravel at top of steep bluff., aneroid 29.130, 780 feet ± at 3:40 p.m.; 29.180 at beach by abandoned dwelling = 745 feet; 29.200 at corner Sections 1, 2, 11 and 12. This is 1,050 paces from highest ridge at the log shanty, or 210 rods. Aneroid 29.250 at foot of grade, edge of the red clay land about 3/4 mile south of the town line; 29.285 at creek 1/8 mile south of town line = 665 feet; 29.255 at town line, corner Sections 1, 2, 35 and 36 at 4:00 p.m. = 675 feet.

Very flat 2 miles north. No change in aneroid except where ravines are crossed. Aneroid 29.255 at 4:30 p.m. at corner Sections 23, 24, 25 and 26, T.44N., R.2W. I go west between Sections 23 and 26 but find no change in altitude. The limestone ridge is very prominent south from Section 34, the crest being either in south part Section 3. T.43N., R.21., or in north part of Section 10.

Aneroid 29.255 at corner Sections 21, 22, 27 and 28; same at corner by Strongsville post office at 5.00 p.m. = 675 feet. The hardwood belt north of Rudyard is plainly visible from here. and extends west considerably beyond the road we took to it north from Rudyard 2 or 3 miles at least. Aneroid 29.250 at corner Sections 19, 20, 29 and 30. There is no road farther west and only a trail south. We turn north 1/4 mile and there a road leads west. We continue north to Rudyard. This plain has only an occasional surface boulder. The red clay is free from pebbles.

A well in southwest corner Section 17 at David Boucher's is 220 feet (3-inch pipe) and it has head 4 feet. It had 175 feet of red clay; blue slush 20 feet; quicksand to bottom; no gravel. Well was made about 7 years ago by owner.

Joe Desrocher's Well, 120 rods north of southwest corner of Section 17, is 216 feet deep and 2 inches in diameter. Made in 1905. It flows about a gallon a minute. Temperature 46 degrees. Red clay 208 feet; slush 41 feet; blue gravel at bottom. The water will flow over the top of a pipe 2½ feet above surface. The ground is no lower than at Mr. Boucher's where head is 4 feet. There are other flows across Pine River, about 2 miles south and a mile west of Mr. Boucher's.

Peter Roger has a well in northeast part of Section 7, 270 feet deep. It is not finished yet. George Lawlor made it. Aneroid 29.250 at well; 29.250 at Rudyard Station, 6:00 p.m. = 685 feet.

Mr. Ed Davidson, in NE¼ Section 22, T.44N., R.3W., has a flow 147 feet, 3-inch pipe, made about 1898. Made by a Newberry driller, James Somerville. It was largely red clay for 75 feet ±. It has a head 3 feet ± above surface. It is a weak flow of perhaps a gallon a minute. Mr. Davidson has another in NE¼ Section 27 about 147 feet, 2-inch well, and has similar rate of flow to the first one. It was made about 2 years ago.

Other wells in this township are: Sam Peffer and Peter Stevenson--turn south from bridge in Section 19 to Section 36, T.44N., R.3W., or south part Section 25. Robert Cartwright, in NW¼ Section 22, has one that flows. Savoie, a Frenchman, in Section 21, across road from Cartwright, has one that flows 2 quarts a minute.

There are flowing wells at each of two stores at Dryburg. Hugh Loughheed, 2½ miles west and 1 mile south of Rudyard, on north side railroad has flow. Another across road at a woman's place. Continue across railroad through gates each side of railroad to a store kept by Mr. Jugal at edge of Dryburg. Ask about well across track from Jugal's. Then to the Elferdink store at Dryburg. Tim Holland, west of Dryburg Station, has one. Inquire about Fuerstanau well there. Mr. Elferdink at store is best posted on the wells.

August 22, 1905. 6:45 a.m.

Rudyard, Michigan. Aneroid 29.400 = 685 feet; 29.440 at Rudyard at 8:10 a.m. Mr. Germain in northeast part of Section 12, drilled 403 feet without reaching rock. The water rises to top of pipe at level of ground. It is cased to bottom. It struck a hardpan crust at bottom. George Lawlor drilled it in 1905. It seems to be same altitude as Rudyard. Profile is 682.6. Well about 680 feet. Pine River is in a valley fully 50 feet deep just west of here.

We go west 2 miles and south 1 mile to Mr. Hugh Loughheed's well, in southeast corner Section 10. Its head is hardly level with surface so a pump is attached. Aneroid 29.450 at well on ground level with that of railroad but 3 feet lower than track = 685 feet. Temperature of water by pumping, 46 degrees F. Depth, 165 feet, 2-inch pipe. It was made about 1896. Drilled by Mr. Somerville. It flowed 1 foot above surface for 2 years or more.

Mrs. Josephine Poirier, in southwest corner Section 11, has a well that did flow but has stopped. It is 167 feet, 3-inch pipe. Made in 1897. Drilled by Mr. Somerville of Newberry. It flowed ½-inch stream, at first. The head is lowered about 6 inches.

Mr. Turcot, on south side of railroad track, about 500 feet west of section line and near line Sections 11 and 14, has a flow made in 1902 of same depth as Mrs. Poirier's that still flows. Temperature 45.75 degrees. It seems to have caused the lowering of head at Loughheed's and Poirier's wells, for it is on lower ground – 7-8 feet lower, or 678 feet, near a ravine. It flows 5 quarts a minute. Pipe, 3-inch, with ½-inch escape pipe 3 feet above surface.

George Vigneu has a well on north side railroad track ¾ mile east of this group of wells of similar depth. Altitude 688 feet. Water comes just to surface or within 1 foot so is pumped.

Antoin LeGault has one on south side of railroad track opposite Mr. Vigneu's that has head 1 foot so is pumped. Altitude 688 feet.

J. T. Jugal's well at store in Dryburg flows 2½ gallons a minute, 3 feet above surface. Made in 1901 by Mr. Somerville of Newberry. Three-inch pipe; depth, 158 feet; temperature 46 degrees; altitude, about 675 feet. The red clay and blue clay is 110 feet. Here, a gravel was struck which had water level with surface. There was quicksand and clay in alternate beds down to 158 feet where the flow was struck in gravel. This is about 120 rods east of line in Section 15.

Eugen Barel has a flow on north side of track about 185 rods east of section line of 15 and 16. This is 152½ feet, made about 1899; 3-inch well made by Somerville. It flowed about as strong as Jugal's, 5 feet above ground, but when Mr. Jugal's was made, it stopped for 2 days and then came back to a head 2 feet lower than at first or 3 feet above the surface, and to a flow 1/2 its former

strength. They are about 60 rods apart. It now flows 5 quarts a minute.

There is a flow at Carl Goyan's, one mile north of Dryburg, on west side of road in Section 9 in south half of NE¼. This did flow more before Jogonal's was made than it now does.

John Elferdink's flowing well at store north of railroad track in Section 15, is 147 feet deep, 3-inch pipe. Rate of flow, 1 quart in 25 seconds; temperature 45 degrees--690 feet A.T.

Carl Gowan's, east of center Section 9, is 145 feet deep; 3-inch; 1 gallon per minute flow; temperature 45.75 degrees. Made in 1901 by Somerville. Red clay to 16 feet; then clay and gravel mixed 10 feet; then red clay to the blue hardpan gravelly crust at bottom. It did flow 2 gallons a minute. Head is no lower than at first--2½ feet above surface. Aneroid 29.445 at well at 10:40 a.m. Temperature shown above. The flow was lessened when a strong draft was made on the well to supply a thresher engine. This probably caused a clogging of the pipe.

Aneroid 29.455 at Dryburg = 690 feet ±. In southeast part of NE¼ Section 17 is a flow at Charles Everett's, 104 feet; 2-inch pipe, that flows about 9 barrels a day. Aneroid 29.455 at well at 11:15 a.m. Temperature 47 degrees F. Head about 7 feet. Made in 1901 by Judson Daly. (See record obtained from driller.)

J. B. Wilson has a well near center of NW¼ of Section 16 that is a very strong flow.

R. G. Trimble has a flow near center Section 17, south of east-west road, 130 feet deep, made in 1900 by Mr. Somerville. Rate of flow, 1½ gallons a minute. Temperature 46 degrees. The head is more than 6 feet, that being height of pipe. The water runs out 3 feet above surface. This is on south side of Trout Brook, Aneroid 29.450 at well.

Thomas Askwith's well, across road near center Section 7, 138 feet. Rate of flow, 5 gallons a minute; temperature 45.5 degrees. It has a head of over 13 feet above surface. Made in 1904 by Mr. Lawlor. Aneroid 29.450 at well at 11:30 a.m.

Aneroid 29.450 at Fibre mill at noon = 697 feet. J. Armstrong owner. Temperature 45 degrees F. There was red clay 85 feet. There was a hard cemented crust. Under this was both clay and quicksand. Water was found in coarse sand. Rate of flow 10 gallons a minute, 7½ feet above surface. The head is 17 feet above surface. Tested with hose. Well was made in 1903 by Somerville. It flows a strong stream 10 feet above surface. The head is much greater. It fills the boiler in about an hour. It does not form scale in boiler and is excellent for that purpose. There is no screen or filter in it.

There were 2 flowing wells at an old mill 2½ miles west of Fibre along the track about 115 feet deep. They were only 2 rods apart and each flowed a 1½-inch pipe full at

the same time. The water would rise into a boiler 10-12 feet above the well mouths (Ross and Brothers' mill). They were made about 1898. The pipes were pulled a year or two ago. There was about 2 feet of sand there above the clay. These were excellent for boiler use. The wells were mainly through red clay. They were drilled with a 3-inch drill and a 1½-inch pipe with filter on bottom to keep out sand.

Thomas Anderson has well in west part of Fibre, 110 feet deep, that flows a weaker stream than these three at the mills. It is 1½-inch pipe with strainer. There was 100 feet of red clay. It was made 5 years ago (1900) by Mr. Somerville. Its head is 18 feet above surface. Flows a gallon a minute 8 feet above. Temperature 44.3 degrees. Fibre is at Mile Post 464. The wells are 3-4 feet lower than the track, or about 697 feet. Aneroid 29.455 at the Anderson well at 1:15 p.m.; 29.450 at Fibre Station = 701.6. This is 120 rods east of town line and the Anderson well is across the track from the station on north side. The mill is 40-50 rods east on south side track. Aneroid 29.470 at T. Askwith well at 1:15 p.m. where it read 29.450 at 11:30 a.m.

The John B. Wilson well in east part of Section 17 has a flow of 2½ gallons a minute. Temperature 45 degrees. It has been running 5 years. Aneroid 29.470 at the wall. It is about 135 feet deep. It will overflow a pipe 7 feet high. It seems to hold its strength.

Mr. Fuerstnau's well, in SW¼ of Section 16, of which Mr. Daly of Pickford gave a record, flows about a quart a minute, 4 feet above surface. It is 80 rods from south line and 50 from west line.

Tom Holland has one 120 rods east that is stronger. Temperature 45 degrees F. Rate of flow about 1 gallon a minute. Depth, 115 feet; diameter, 3-inch. Made about 1901 by Somerville. It is about 80 rods from south and 100-120 from east side Section 16. Nearly all red clay; fine gravel at bottom. Aneroid 29.500 at well. There was a weak vein at 60 feet.

There is another on ground 6 feet higher that still flows though the pipe is pulled. It is a little deeper than the one now in use. Aneroid 29.485 at Dryburg at 2:50 p.m. = 690 feet.

Savoie well, NE¼ Section 21, flows 2 quarts a minute. Temperature 46 degrees. Depth, 113 feet. Made in 1903. Has head more than 5 feet above; 2-inch pipe to bottom. Gravel (1 foot) at bottom).

Mr. Robert Cartright's well is a weak flow--a mere trickle. It was made in 1902. Depth 132 feet. Made by Somerville. It has always been weak.

One at old house 80 rods south, on H. McCuaig's land, near middle of west side Section 22, has been made 5 years. No one living there now. Owner lives in British Columbia. Rate of flow, 1 quart a minute. Temperature 47 degrees F.

There is another well about 5 miles south of Cartright's on Mr. Ackridge's farm, 117 feet deep; 2-inch. Made in

1901. Flows about 1 quart a minute. In T.43N., R.3W., northwest part Section 4. Aneroid 29.485 at Cartright well and the other two near it.

The Davidson well in northeast part Section 22 flows 3 quarts a minute and has head 1½ feet above surface. Temperature 46½ degrees. Aneroid 29.490 at well in northeast part Section 22. The one a mile south flows about 1 gallon.

There is a prairie in Sections 21, 22, 23, 27 and 28 due to burning of timber from it many years ago--between 1845 and 1850. The stumps and logs are nearly all rotted. It looks much like the western prairies and has a rich soil. We go east across center Sections 23 and 24. Aneroid 29.500 at town line; 29.571 at Pine River at bridge in Section 19 at 4:45 p.m.

Aneroid 29.500 at S. N. Peffer's in northeast corner of SE¼ Section 36 at flowing well 186 feet deep (2-inch pipe) = 670 feet ±. Flows 2.4 gallons a minute. Temperature 46 degrees. The clay is 180 feet. Below this is slush and sand. Made in 1904. Drilled by Geo. Lawlor.

Peter Stevenson has one in southwest corner of NW¼ Section 31; has a flow about as strong as Mr. Peffer's. It flows 12 quarts a minute. Depth 173 feet; 2-inch pipe; sand at bottom; balance, red clay. G. Lawlor, driller. Made in 1904.

Near middle of north side NE¼ Section 35 is a very strong flowing well, filling a 10-quart pail in 12 seconds or 12½ gallons a minute at level 3½ feet above surface. When first made, it flowed 42 gallons in 70 seconds. It was made in August 1904 but began to decrease in May 1905. Albert Douglass is owner. George Lawlor, driller. Depth, 188 feet. There was 150 feet of red clay. There was sand to a gravel where the well was stopped. Temperature, 45 degrees. There is a slight iron stain here and in the Peffer well. Aneroid 29.500 at the Douglass well at 5:45 p.m. = 670 feet ±.

S. McDonald has a flow 1/2 mile east of town line in central, part Section 31 east of Stephenson's--rises 2 feet above surface and flows quarts --2--a minute. Depth, 208 feet. Drilled in 1904 by George Lawlor. Temperature 46½ degrees.

The Stephenson's struck a water vein and then went to where water was taken in by the pipe instead of discharged. The pipe was then pulled back a little and the flow obtained. Aneroid 29.490 at Stephenson's at 6:45 p.m. = 670 feet.

Aneroid 29.565 at Pine River in Section 19, T.44N., R.2W., = 610 feet; 29.485 at Rudyard at 7:50 p.m. = 685 feet. Mr. L. R. Adamson, southeast corner Section 21, T.44N., R.2W., near Strongsville post office, is 147 feet. The red clay was 130 feet; then a black shale, 15 feet ±; gravel 2 feet. Hardpan crust drilled through at bottom. Head, 12 feet. Very strong well; 3-inch pipe. It was first dug 37 feet, 4 feet square.

Mr. Mike Knauff in northeast part Section 28, has well 144 feet with head 16 feet ± from top. Material penetrated is similar to the Adamson well just noted but well is not so strong as Adamson's.

George Pott's well in NE¼ Section 26 (west half) is 120 feet with head 20 feet.

In SE¼ Section 22 at Dickson Perry's is a weak well, 67 feet, with head 20 feet. (Information by L. C. Leonard of Rudyard, who helped make the last 5 wells noted.)

August 23, 1905. 7:30 a.m.

Aneroid 29.420 at Rudyard = 685 feet. We drive east on line Sections 5 and 8 1/2 mile to Mr. G. W. Kelly's flowing well in north part Section 8. Aneroid 29.430. It is a mere trickle out of pipe 4 feet above surface. It was Made several years ago and flowed pretty well until 2 months ago. Made by Daly of Pickford, Depth, 113 feet. Diameter, 3-inch.

Mr. S. Kendrick, across road in south part Section 5, has a flowing well that runs 8 gallons a minute at 2 feet above surface from 1½ inch pipe. Diameter. 3-inches. Temperature, 45 degrees F. Made by Mr. Somerville 9 years ago. Depth, 100 feet,

Mr. Harry Johnson, near middle of north side NE¼ Section 8, has a well flowing 3 gallons per minute from 3/4-inch reducer on a 3-inch pipe 3½ feet above surface. Temperature, 45 degrees. Depth, 98 feet. Made about 9 years.

Mr. G. Huntley, in south part of SE¼ SE¼ Section 5 has a flow 96 feet deep made in 1897. Head 10 feet above surface. It runs out of 1/2-inch hole at side of 3-inch pipe, 3 feet above surface, 3 gallons a minute. Temperature 45 degrees F. Mr. Huntley dug a 50-foot well and then bored to 74 feet and got a flow. This was 11 years ago and was the first well made. It is now abandoned, because it smelled rank. The red clay is 74 feet, below which is 5-6 feet of blue slush, then a quicksand and gravel at bottom. There is a little vein of black sand at about 40 feet that smells bad.

Mr. A. Pitsen, in northwest part Section 9, is 92 feet; made by Mr. Huntley in 1898. Section similar to Mr. Huntley's. Rate of flow, 4 gallons a minute from 3/4-inch hole in a 5-inch pipe.

Mr. T. Michean has a well 92 feet in southwest corner Section 4; section similar to Huntley's well. Made about 1900. It flows 5 gallons a minute through a 1/2-inch hole in a 1-inch horizontal pipe connected with the 3-inch pipe of the well. Temperature, 44.5 degrees F.

Mr. Naeme has a well near middle east side Section 8. Depth. 98 feet. Diameter, 3-inch. Made 7 years ago by Somerville. Flowed about 2 quarts a minute. It stopped at a hardpan crust.

Mr. Nesse's well, in northwest corner NE¼ Section 9, is 104 feet deep, 2-inch diameter, and flows a weak stream at top of pipe 5½ feet above surface. Made in 1904.

Made by Lawlor. Probably is at about full head at the discharge pipe.

Mr. Bolman's well, across road in southwest corner SE $\frac{1}{4}$ Section 4, is 82 feet. Diameter, 2-inch; head, 2 feet above surface. It enters gravel 2 feet \pm and a hardpan crust at bottom. It flows only a weak trickle. Made in spring of 1904 by Geo. Lawlor.

Aneroid 29.420 at schoolhouse, southeast corner Section 4, at 9:00 a.m. = 685 feet \pm . Mr. Glastader's well, northwest part SW $\frac{1}{4}$ Section 3, flows about 1 pint a minute 3 feet above surface; 3-inch pipe. Depth, 100 feet. Aneroid 29.420 at well = 685 feet.

Aneroid 29.420 at town line, corner Sections 3, 4, 33 and 34 = 685 feet. There is a perceptible rise for 1/2 mile west of these corners, probably 20 feet, to a boulder-strewn swell. On its east slope are the flowing wells of Dolman (in Section 4) and Johnson in Section 33. The Garrett Dolman well is higher, 4-5 feet, than the Johnson. Aneroid 29.410 at Dolman well = 800. It is 72 feet deep and flows 2 quarts in 55 seconds 2 $\frac{1}{2}$ feet above surface. Temperature, 46 degrees F. Made in June 1905 by owner. It is at full head now, 2 $\frac{1}{2}$ feet above surface. The wells are nearly 1/8 mile apart. The William Johnson (of Kinross) well is about 68 feet and flows 180 barrels of 42 gallons in 24 hours. Temperature, 46 degrees F. When this flows an hour Mr. Dolman's is lowered 7 inches but very little lower if it flows longer. It is reddish clay for 50 feet and below this is a slush in each well. Water is from a black gravel about size of buckshot. The Johnson well tastes of sulphur but the Dolman well does not show a decided taste.

No attempts have been made east and north from here to get flowing wells. Mr. Dolman thinks the clay thickens in these directions. The altitude is lower than at Dolman's or Johnson's so flows can probably be obtained.

I return to schoolhouse southeast corner Section 4. Aneroid 29.415 at 10:00 a.m.

The well of Michigan Land Company flows a trickle out of 3-inch pipe 4 $\frac{1}{2}$ feet above surface. Temperature, 48 degrees. It is in northwest part Section 10.

A. Habella well is in northeast corner Section 9 and flows about 1 $\frac{1}{2}$ pints a minute 5 feet above surface. Made in 1903. Depth, 108 feet. Driven 3-inch. (See Daly's notes.)

Albert Honsim, in south part Section 3, has well 151 feet, made in 1904 by George Lawlor. It discharges 4 feet above ground from a faucet. It flows 3 gallons a minute from 1/2-inch faucet. Temperature not taken.

Gilbert A. Smith in NE $\frac{1}{4}$ Section 10 near center of quarter section. Made in 1903. Depth of well, 171 feet. It was all clay to gravel at 170 feet. Discharges 1 $\frac{1}{2}$ feet above ground 1 $\frac{1}{4}$ gallons a minute. (See Daly's notes obtained at Pickford about 2 weeks ago.)

Mr. Garvin's well. in southwest part of Section 10, rises to surface in a basin but has a pump attached. It is 3-inch. Depth, 100 feet \pm .

Mr. A. Wice, in north part Section 16, east of quarter posts has a well 88 feet that has head at the surface so a basin is dug and pump attached. It was made about 1899 by Nordhoff of Rudyard. It is 2-inch now but a 3-inch hole was driven. Temperature by pumping, 44.5 degrees F.

Fred Jacobson has one about 100 rods from west end of line Sections 9 and 16 in south part of Section 9 that is about 113 feet deep and overflows. It was made in 1901 by Mr. Huntley. This well has a pump attached and by vigorous pumping I get a temperature of only 43.5 degrees.

Aneroid 29.410, 680 feet, at corner Sections 9, 10, 15 and 16; 29.425 at corners 1/4 mile west of Strongsville at 11:00 a.m. (corner Sections 21, 22, 27 and 28 = 675 feet). See notes taken last night at Rudyard for wells in this vicinity.

There is a wide gap in the limestone hills where Pine River runs south which is filled with flat clay land. I am told, some distance into T.43N., Ranges 2 and 3 West. There is limestone in south part of T.44N., R.4W., in Section 36 and west-northwest from there toward Alexander Station. It also extends south over T.43N., R.4W. From Strongsville the outline of this distant range is plainly visible, while the one east of Pine River lies immediately south and has the prominence of a small mountain. It does not extend a mile west.

Aneroid 29.435 at Strongsville at 12:20 p.m. We take road south = 670 feet. Aneroid 29.445 at corner Sections 27, 28, 33 and 34, T.44N., R.2W., at 12:35 p.m. = 660-665 feet; 29.410, 695, about town line at south edge of swamp where a track is cut through from south of east to north of west; 29.400, 700, on sandy beach that runs northeast-southwest. The south part of swamp is sandy. Aneroid 29.390 at edge of hardwood; 29.330 on brow of a tableland at a clearing on west side of clearing at 1:15 p.m. This is a sandy plain apparently cut back by the waves 30 rods \pm . Aneroid 29.330 at east edge at base of a beach of gravel = 775; 29.310 at top. This is 30-40 rods wide. Aneroid 29.290 at foot of a limestone cliff east of the clearing 60 rods; 29.185 at top of escarpment at 1:35 p.m.; 29.175 20 rods farther east on top of country; 29.150 at foot of another low escarpment 80 rods \pm east; 29.130 at top of ledges = 950 feet \pm . We skirt the north edge of a little rocky cliff 1/2 mile farther east. Aneroid 29.150 on top; 29.200 east of the cliff at foot of a rather rapid slope probably a mile east from where we started east.

A short distance south I come to a large beach line, 10 feet \pm high and 10-15 rods wide. Aneroid 29.200 on top of beach = 875 feet \pm . There is a lake south of it about 1/8 mile. Aneroid 29.220 at lake at 2:30 p.m. = 855 feet. This lake is in northeast corner of Section 15, T.43N., R.2W. We follow the beach on north side of the lake for 1/4 mile or so beyond the lake. The lake itself is nearly

1/4 mile across. Then we rise to an escarpment of limestone. Aneroid 29.150. We follow this southeast to where it runs south and drops down on east side to a cut bluff. Aneroid 29.220 at base, or at edge of the beach. The base of ledges is 15 feet \pm higher, or almost in harmony with the beach on north side of the little lake.

Aneroid 29.250, 830 \pm at road leading north-south not far from where we were on it August 21. We skirt along the east side of the limestone cliff for a mile or more south, the aneroid reading about 29.200 at base, or 870 \pm A.T. The cliff rises rather abruptly 30 or 40 feet. No stream is crossed before we reach the St. Ignace road.

Aneroid 29.200 at intersection with St. Ignace road at 4:30 p.m. = 870 feet. There is a beach along this north-south road in places at same level as foot of the limestone cliff. There is a sandy drift along the road and few limestone blocks are exposed. Granite boulders are much more common.

About 1/4 mile south of intersection with St. Ignace road we cross a strong beach running northwest. Aneroid 29.185 on crest = 870 feet; 29.210 at place where road runs east on south side of beach. We rise to the beach about 20 rods east of turn in road. Aneroid 29.190 = 865-870 feet. There is a somewhat rapid descent of 25 feet east of this beach and a flat tract extending to near the town line where another beach is crossed that runs west-northwest - east-southeast. Aneroid 29.220 on top = 840. It is a gravel beach like the higher one. Aneroid 29.235 on flat west; 29.245 about 1/8 mile farther east at cross roads by a clearing and abandoned dwelling-- probably the town line. Limestone blocks have not been numerous west from here but from this cross road east, large limestone blocks abound, some being 6-8 feet in diameter. They are picked up in fields. They seem to be along the north base of the last beach we crossed. That beach runs eastward about 80 rods south of the road from the cross roads east.

About 1/4 mile north of the road beginning 1/2 mile farther east is a swampy tract that seems to extend beyond Taylors Creek. It approaches the road eastward and the altitude is less along the road. Aneroid 29.270 about a mile east of the town line at a culvert in road. The road soon turns south to base of a, high limestone bluff that probably supplied the blocks noted to the west. It is 75 feet high. Aneroid 29.220 at base. There is a series of beaches built along its base all at the same level. Aneroid 29.220 = 845 feet.

Aneroid 29.200 = 845 feet \pm at L. Brown's where we stop for the night in Section 32, T.43N., R.1W. Aneroid 29.190 at a higher beach against face of bluff south of Mr. Brown's = 865-870 feet; 29.130 on top of bluff = 925 feet. This is a narrow point, 40 rods \pm wide on top and a low plain lies south of it. Aneroid 29.220 at north edge of the plain. From this point of high land one can see the waters of Lake Huron and Mackinac Island to the south, and Pickford to the north, and the vessels in St. Marys River to the northeast. This bluff has limestone on its north side and drift on the south. The south part is 15-20

feet higher than the north and may be a beach. This high ridge is only 1/2-3/4 mile long east-west and less than 1/4 mile north-south. It was an island when the beach was formed where aneroid reads 29.190. The gravelly ridge that is crossed just before and just after turning east at middle of line of Sections 25 and 26, T.43N., R.2W., runs from the west end of this high ridge westward a mile or more and then northwestwardly to the high limestone tract in T.43N., R.2W.

Mr. Brown says a limestone cliff runs along the north side of the old stage road at a distance of 1/8 to 1/2 mile for 3 miles west from where we came south, its edge being in southern part of Sections 21, 22 and 23 and perhaps, in places, touching the sections south of there.

There seems to be no outlet for the lake we passed this afternoon. The beach on its north side is continuous and there are limestone cliffs on the east and west sides. Whether it has a beach on the south was not ascertained but in view of other features it seems unlikely. The limestone highland seems to be unbroken on the east, south and west of it.

Mr. Brown has driven a well 53 feet at his house without reaching rock, yet it is not 15 rods from the bluff. Water was struck in a quicksand.

Mr. Webb, on flat south of the ridge, on east edge of Section 31, struck rock at 35 feet and has a weak well.

August 24, 1905. 5:30 a.m.

Aneroid 29.360 at L. Brown's in Section 32 on the lower of the two beaches, 845 feet \pm ; 29.275 on hill back of Mr. Brown's. This does not look like a beach on the top but is covered with limestone slabs. The soil is a sandy loam on top but on the north slope it is clear sand in places. Aneroid 29.370 at Mr. Brown's at 6:00 a.m. = 845 A.T. Mr. Brown says there is a bluff 2 miles south from here near corner Sections 5, 6, 7 and 8, T.42N., R.1W., below which is a swamp that extends to St. Martin's Bay. The bluff is 60-75 feet or more. This is probably at the Battlefield beach.

Hear center of Section 36, T.43N., R.2W., is a large spring issuing from a limestone hill and forming a small creek shown on the map. It is 6-10 feet wide and a few inches deep.

Aneroid 29.400 at L. Brown's at 7:20 a.m. = 845 feet \pm A.T. Aneroid 29.440, 810 feet, on a beach line near corner Sections 32, 33, 28 and 29 at 7:30 a.m. This runs through north part of Section 33 and crosses into Section 28 near east end of line. Aneroid 29.410 at higher beach at corner Sections 27, 28, 33 and 34 on which I took a reading August 21 = 845 feet. This runs west-southwest about 1/4 mile and dies out in a swamp. Another ridge of same altitude runs southwest across northwest part of Section 34 and crosses into Section 33 just north of quarter post s 840 feet.

Aneroid 29.375 = 890 feet \pm on ridge near town line. This is bouldery and has a loamy soil but sandy nucleus.

It seems to be glacial. There is a rolling bouldery tract south of it. Aneroid 29.370 on crest of a ridge 100 rods south of town line = 890 feet ±. It is boulder-strewn and has a loamy soil and is apparently glacial. It is on this ridge 1/4 mile east from here that a lake survey tower was built (the Robinson. 989 feet). Aneroid 29.410 at south base of ridge about 1/2 mile south of town line s 8/0 feet. There is a gradual descent to sandy ridges 1/4 mile farther south, aneroid 29.440 = 845 feet ±. There is a succession of ridges of this height to corner Sections 3, 4, 9 and 10. South of them is a higher tract. Aneroid 29.415 at summit on road just south of section corners. The altitude increases rapidly eastward, and there is a wave-cut border just a few rods southeast of this corner. Aneroid 29.410 at old shore = 870 at 8:20 a.m. The aneroid is changing to high barometer so this is probably the same as the highest-beach traced yesterday afternoon in T.43N., R.2W. There are a large number of limestone blocks on the surface from this section corner southward and limestone occurs at medium depth.

About middle of line ox Sections 9 and 10, where a road leads east, is the brow of a steep bluff. Aneroid 29.430 on top. This has strong wave action against its face and south of it is a lower plain. Aneroid 29.490 at base of bluff = 800 feet ±; 29.515 at creek near south end of line Sections 9 and 10 = 775 feet. This plain is boulder-strewn for 1/2 mile south of the bluff. We then enter a sandy strip with only occasional boulders. Aneroid 29.560 on bold bluff 1 mile north of Hessel, 740 feet; 29.600 at first beach on slope = 700 ±; 29.650 at foot of bluff at an old shore = 660. Is this the Fort Brady? Aneroid 29.660 a few rods south where a road leads northwest, at 9:00 a.m. Aneroid 29.675 at exposures of rock at roadside 1/4 mile south of rock bluff = 635 ±.

We soon find a striated surface. The bearings differ 15 to 20 degrees but they are mainly about N65°W to S65°E, altitude 615 feet. Aneroid 29.700 on a drumlin just north of Hessel at 9:15 a.m. This is very thickly strewn with limestone blocks. I do not see limestone in place. Aneroid 29.740 at Lake Huron level, 580 feet A.T., at 9:20 a.m.

We return to the striated ledge 1/2 mile north of Hessel and examine it carefully to see if there is evidence as to whether the ice had an eastward or a westward movement. There is a north-south crack that has higher surface on west than on east side so there is resistance to moving the trowel westward across it. There are shallow pits bruised on the east side by glaciation but not on the west. These seem clearer evidence than that from the crack that the movement was eastward. The altitude is about 35 feet above Lake Huron at this exposure. The drumlin-like ridge just north of Hessel is of the same altitude. Between is a sag filled with clay that is only 15 feet above lake level.

Aneroid 29.680 where a road leads off to the northwest 3/4 mile north of Hessel at 10:00 a.m. where it read 29.660 an hour ago = 645. This is near the level of the main Nipissing, perhaps 8-10 feet lower.

We take road northwest and soon come to the beach that is cut in the face of the bluff. Aneroid 29.615 = 690 feet ±. This seems equivalent to the one at Fort Brady in Sault Ste. Marie while the one 30 feet lower is the main Nipissing. The bluff is a fine sand both above and below. We follow the bluff west-northwest for about a mile. It then runs more nearly west and the road runs back of it, continuing northward to a little lake in northwest part Section 16. Aneroid 29.590 at lake = 715 feet A.T. We go west on south side of lake through a plain about 10 feet above it. Is this a lake level? The land north of the lake is about 30 feet above it. We soon turn north onto it. Aneroid 29.550. There is a sandy plain here that was timbered with pine extending 1/2 mile ± north from the lake. Aneroid 29.510 at beach at base of bluff just south of corner Sections 5, 6, 7 and 8, T.42N., R.1W., = 790 ± feet. (Lake level may be 800 feet ±.) This bluff runs east-west for a mile or more. On top of it are three gravel ridges trending northwest-southeast about 100 yards apart, the south ends of which are cut off at this bluff, and still others farther east, all apparently at same level and with similar trend.

Aneroid 29.470 on gravel beach just south and west of section corners = 825 feet ±. Within 1/4 mile north we cross a beach 15 feet higher or 840 feet A.T. There is hardwood timber from the bluff in north part Sections 7 and 8 northward and a more gravelly material than that below the bluff, the latter being a barren sand unfit for agriculture.

Aneroid 29.470 at town line at Sections 5, 6, 31 and 32 at 11:00 a.m.; 29.450 on gravel ridge 120 rods north. This trends slightly north of west. Aneroid 29.415 at upper limit of wave action against the limestone hill or rather at base of steepest part of the hill = 870 feet A.T.; 29.350 on top of ridge = 930 feet ± A.T.; 29.415 at foot of steep slope on north side = 870 feet; 29.440 at Lewis Brown's at 11:25 a.m. = 845 feet; 29.440 at Mr. Brown's at 12:30 p.m.; 29.475 at quarter post Sections 29 and 30, T.43N., R.1W.; 29.470 at town line at quarter post Sections 25 and 30; 29.440 on beach 80 rods west of line. It trends west-northwest from line. Aneroid 29.415 on upper beach in west part of Section 25 = 870 feet.

After turning west into Section 26 I reach the crest of upper beach in about 30 rods from section line (aneroid 29.410 = 870 feet) and it here trends slightly west of north. There is a slough on its west side. This one was formed by the Munuscong Bay east of it. About 30 rods farther is one formed from the St. Martin's Bay side at same altitude, aneroid 29.410. There is a second ridge formed at same level on the St. Martin's Bay side. These both run slightly north of west. We come to a camp at center of NW¼ Section 26 that is on the second Algonquin beach. The limestone cliff is reached at the north edge of this section. It only reaches about 80 rods east of corners of Sections 22, 23, 26 and 27. From there it runs north. It is 50 feet ± higher than the Upper Algonquin or 920 feet A.T. There is a good spring at south side of beach here at center of NW¼ Section 26. Aneroid 29.440 on second beach s 845; 29.450 at spring

at 2:15 p.m. At the line of Sections 26 and 27 the limestone cliff is only 20 rods north and I go up on it. Aneroid 29.350 at top = 930 feet ±, 29.410 at base; 29.445 at road on line Sections 26 and 27, at 2:25 p.m. = 850 feet ±. Near middle of Section 27, 80 rods ± north of center, we descend 30-40 feet. Aneroid 29.480 at base of a bluff at beach No. 3 = 815 feet. There is a change here to a sandier soil and to timber with pine and hemlock. It has been chopped off, while that to the east is a virgin forest.

Aneroid 29.500 at Daggett's Clearing near line Sections 27 and 28 = 800 feet. No one lies in dwelling now. Limestone is near surface here. Aneroid 29.515 at cedar swamp 1/4 mile west of Daggett's = 790 ±. After crossing this swamp there is a gradual descent for 1/4 mile ± (aneroid 29.535) to where a steeper descent begins. Limestone is at slight depth all through this plain. Aneroid 29.550 at foot of steeper descent at a corduroy = 760. Perhaps this descent is due to dropping off from a limestone ledge. This is probably near line of Sections 28 and 29. There is a gradual descent for 1/4 mile or more, then a rapid descent. Aneroid 29.590 at a terrace on this steep slope a few rods wide, probably a shore line. 725 feet ±; 29.625 at foot of slope near middle of Section 29 and 1/4 mile north of center; 29.640 at a narrow beach, = 670 feet ±, running north-south past an old camp in Section 29 about 80 rods from west line; 29.650 at line Sections 29 and 30 at 3.30 p.m.; 29.640 on sharp sand ridge 20 rods west of section line, 670 ±. It runs north-south. Aneroid 29.655 at flat on west side of it. The width is only 6-8 rods. Aneroid 29.670 on flat about a mile farther west near range line. This is in a clay swamp like the red clay tract around Rudyard and east from there to Pickford. Aneroid 29.680 at old Mackinac road at line Sections 25 and 26 in north part at 4:15 p.m. = 635 feet ± A.T.

Aneroid 29.725 at Pine River, near corner Sections 23, 24, 25 and 26 at 4:20 p.m. = 590 feet; 29.655 at farmhouse in Section 6, SE¼, at Mr. Knauf's = 650 feet. Mr. Knauf says there are sandy ridges east and southeast from here in Sections 5 and 8 on west side of the limestone ledges at 50 feet ± higher altitudes or 700 feet ± A.T. They are only a few feet high and there are clayey strips of swamp between them. Aneroid 29.655 at 6:30 p.m.

Aneroid 29.640 at end of east-west road 3 miles south of Rudyard = 670-675 feet. I am told that the drainage by artificial ditches in T.44N., R.2W. is southward from near north side of township past the county road that runs east-west past Strongsville post office.

Beaches North of Hessel

Lake Huron	580 feet
Main Nipissing	650-655
Fort Brady	690
Ice defined shore	715
Strong cut bluff	790

(Lake may have been 800 feet)

Top of bluff	825--Battlefield ? beach
Lowest ? Algonquin	825
Gravel ridge	840
Gravel ridge	850-855
Highest Algonquin	870 feet

August 25, 1905. 5:00 a.m.

Aneroid 29.685 at Rudyard Station = 685 feet ±. The aneroid shows no change to the west Pine River but west from there a gradual ascent begins. Aneroid 29.675 at Loughheed's flowing well in southeast corner Section 10 = 688 feet.

Aneroid 24.685 at Dryburg = 690 feet. The Jugal well is about 10 feet lower but at the Elferdink well the altitude is only 3 feet below track.

There seems to be no ascent west from Dryburg, but a slight descent. Aneroid 29.695 at Fibre at 5:40 a.m.; 29.705 at Fibre at 6:30 a.m., Mile Post 464, = 701.6 feet; 29.710 at Fibre at 7:00 a.m. and at 7:20 a.m.; 29.700 1 mile west of Fibre at 7:40 a.m. = 710; 29.715, 724 feet, at Mile Post 462 at 8:00 a.m. Just east of here is a sand ridge 10 feet ± high, running along north side of railroad for 40-50 rods.

Aneroid 29.715 at old mill site 1/2 mile farther west, where there were flowing wells; time, 8:15 a.m. = 735 feet. This is in a cedar swamp. The higher land with hardwood timber and limestone sets in 1½ miles west at altitude 780 feet.

We go south past a camp and enter hardwood timber less than a mile from the railroad. The surface is plane but rises gently southwestward. Aneroid 29.700 at dock about 40 rods east-southeast from corner of Sections 22, 23, 26 and 27 at 8:50 a.m. = 750 ±. The camp is in northwest corner Section 27 and a well in southeast corner Section 21 is 90 feet deep. It is through sand and gravel nearly all the way and water does not rise much. The Finn settlement in Section 26 have only shallow driven wells 10 feet ±, driven with a maul.

South from Bear Creek is a gradual ascent over gently undulating surface with sandy loam soil and hardwood timber. No boulders or limestone blocks in Section 26. The ridges are of fine sand.

Aneroid 29.680 at small creek in south part Section 26; 29.670 on sandy ridge south of creek at 10:00 a.m.; 29.660, 780, at old camp, probably in Section 35, at base of a prominent hill by a little rill or very small brook made by a spring; 29.660 at same place 1/2 hour later = 780 feet ± A.T. We go east 1/3 mile ± along a terrace (aneroid 29.640) that seems to be a shore line = 790 feet ±. Back of this is a ridged belt that may be a beach about 75 feet higher. A higher beach sets in on the slope as we go south; aneroid 29.560 = 860 feet ±.

Aneroid 29.500 = 910 feet ± at top of bluff. The limestone is at surface on all this hillside.

We go west on north edge of county rising to 29.420 or about to 990 feet. Aneroid 29.410 at Lake Survey Station on north edge of Mackinac County, 999=1,000 feet ±, in northeast part of Section 3, T.43N., R.4W. Aneroid 29.370 at top of tower (Maple Station).

We go northwest from tower down the slope. First rock shelf or terrace, aneroid 29.490, 920 feet ±. Sand 29.530, 880 feet, a terrace under bluff; 29.545 on sandy ridge = 865 (Algonquin beach). Aneroid 29.570, 840 feet, at a lower sandy ridge; 29.590, 820 feet, at another sandy ridge; 29.615 at spring where we stopped to eat before going up to tower where it read 29.660 at 11:00 a.m. It is now 12.30 p.m. = 780 feet ±.

The tower seems to be on an island that stood above Lake Algonquin. We take road south along the west edge. From the tower we could see lower land both to the east and north. It drops off more gradually to the south. We have ledges in view to the east of this road for more than a mile south of the tower (See notes in October 1916).

Aneroid 29.485, 900 feet ±, at base of a steep cliff 25 feet ± high, about a mile south of the tower. From here the ledge runs eastward and we do not have it in sight any farther. The land gets lower gradually to the south.

Aneroid 29.520, 865 feet on a ridge between Pine River and Hound Lake about 2 miles south of Lake Survey Tower at 1:30 p.m. Aneroid 29.570, 820 feet it at a spring by a place where people camp on east side Round Lake. Temperature 47 degrees F. Aneroid 29.550 on general level of plain south from here = 830-835 feet.

We soon drop down a little along base of a low limestone escarpment, the top of which is about same as general level. Limestone blocks have been present all along this route but not so large as to be very conspicuous. The soil is a sandy loam with occasional development of gravel where there was wave action on the old shores.

The road swings around to the west shore of Round Lake on a plain where aneroid reads about 29.540 at 2:30 p.m. = 845. Aneroid 29.550 where road turns due west on section line, leading to Palms = 835 feet ±. There is a very stony tract west from here with limestone reefs 5-10 feet high. Aside from these it is very flat.

About 4½ miles east of Palms a descent of 50 feet is made. Aneroid 29.610 = 785 feet, near Chambers Brothers camp. It is probably near corners Sections 20, 19, 30 and 29, T.43N., R.4W. Aneroid 29.625 = 730 feet ± at north branch Carp River. It is 1/2 mile west of the bluff just noted. Aneroid 29.600 on plain 1/4 mile west of the stream = 790 feet. Limestone blocks are not scarce here.

There is a gradual ascent westward for a mile, aneroid 29.560 = 830 feet. The soil is black, although limestone

is very near surface and the blocks are numerous. Aneroid 29.650 in swamp 2½ miles east of Palms = 750 feet ±. Aneroid 29.670 at stream 2 miles east of Palms = 730 feet ±. West of this stream a rise of 50 feet is made to a boulder-strewn tract with occasional sandy knolls and low ridges but generally a rich heavy soil. There are very few limestone blocks, the boulders being chiefly granite.

Aneroid 29.610 about 1 mile east of Palms where limestone ledges set in = 800; 29.585 at top of ledges, 40 rods west = 815 feet; 29.615 at Palms (Kenneth Station) at 5:30 p.m. = 786 feet (775 by Gannett).

The well at Leonard's mill on ground 15 feet lower than station enters rock at 10 feet and is 75 feet deep. It is a 6-inch well and has head 8 feet below surface. He uses it in boiler but uses a compound to fresh it and prevent scale. He thinks it would flow if properly cased. Made in 1903.

W. J. Ross, at post office (Kenneth), has two wells over 100 feet deep. One in barnyard is 117 feet, entirely through limestone, for the rock is within a foot of surface. Head, 35 feet. One at house, on ground 6-8 feet lower, is 108 feet. They are both a few feet higher than the station. Both 6-inch wells. Made in 1904.

Aneroid 29.610 at Kenneth = 786 feet (775 by Gannett). Aneroid 29.550 at Ozark at 7:00 p.m. = 854; 29.520 on hill 1/4 mile east.

A well at mill at Ozark passed through sand 22 feet to limestone but on the hill it is at the surface and a well there is 100 feet.

August 26, 1905. 5:00 a.m.

Aneroid 29.500 at Ozark Station = 854 feet (842 by Gannett), I go up a hill east of Ozark and find a striated surface with magnetic bearing 12 degrees south of west on a ledge at roadside just east of the large barn near where road turns north. Aneroid 29.465 on highest points near this set of buildings. There are points 1/4 mile southeast about 10 feet higher or 40 feet above Ozark Station and 894 feet A.T. The land is cleared for a mile north and east from here and about same altitude. I can see a wooded tract fully as high 2 miles or more north and a little east of this point. The altitude seems to be somewhat lower to the west but about 6 miles west I see a high range that has its east edge trending west of south.

There are falls on Carp River in southwest part of T.43N., R.5W. It descends over ledges for about 3/4 mile. There is no rock along the stream above the falls.

Aneroid 29.510 at Ozark at 6:15 a.m. = 854 feet (Gannett has Ozark 842 feet). We follow railroad to Trout Lake. Aneroid 29.550 at Mile Signal north. Ledges show for 1/2 mile northwest of Ozark.

Aneroid 29.535-29.545 in a cedar swamp north from here for 2 miles; 29.535 at Dell Station at 7:15 a.m. on a

low sandy ridge 5-6 feet above swamp. The railroad here turns northwest. It has been running north-northwest from Ozark to here. It leaves the cedar swamp and runs through a hardwood tract having a sandy soil and low sandy ridges.

Aneroid 29.570 at Trout Lake at 8:00 a.m. = 830-836 (Gannett makes Trout Lake 830 by D.S.S. & R. railroad and 836 by Soo Line railroad. Both on same altitude). Aneroid 29.510 on sand ridge 1/4 mile east of railroad crossing = 885 feet. From here we look east 2½ miles to north end of the limestone and high country. The compass makes north end 5 degrees north of east from this station.

There is no limestone within 2 miles northwest of Trout Lake. It sets in in Sections 17 and 20, T.44N., R.6W. The limestone comes to within 80 rods of the Soo Line 3 miles east of Trout Lake Station in south part Section 20, T.44N., R.5W. It lies a mile south from the schoolhouse in Section 22, or in central part Section 21. The limestone from the Carbide Works at Sault Ste. Marie is from Section 16, T.44N., R.7W. The railroad spur to it leaves the South Shore railroad about 2 miles southeast of Hendrie.

Aneroid 29.585 at Trout Lake at 9:00 a.m. = 837 feet. Wells are only 12 feet deep here or about to level of the lakes around the village. There are dunes 30-50 feet high east and west and north but lower south of this railroad crossing. Trout Lake is at Mile Post 450.

We take train to Rudyard at 9:00 a.m. on the Soo Line. This leads through a tamarac swamp with huckleberry bushes 3½ miles to the hardwood and limestone tract, aneroid 29.550 = 860 ±. There is a rise of 50 feet ± from the track up to top of the hill within 1/4 mile south or to about 910 feet. The rise begins only a few rods from the railroad.

Aneroid 29.570 at station 6 miles east of Trout Lake = 835 feet. There are sandy ridges here. The timber is hemlock, etc., on ridges but tamarac and cedar in the swamps. Aneroid 29.600 in swamps about 2 miles farther east, near Alexander, Mile Post 458 = 814 feet. The high limestone comes to within 1/2 mile of the railroad for a short distance just east of here but it is a projecting point. It is probably 75-100 feet above the track. There is an undercut cliff near top. There is a continuous eastward descent on the railroad.

Aneroid 29.690 at old mill site 2½ miles west of Fibre where we left the railroad yesterday = 740 feet; 29.715 at Fibre at 9:30 a.m. = 701.6 feet; 29.730 at line Sections 16 and 17, T.44N., R.3W.; 29.735 at Dryburg, 690 feet.

Aneroid 29.740 opposite Jogall's. His well is 8 feet lower--675 feet; 29.735 at Loughheed's flowing well = 688 feet; ditto 3/4 mile east where wells have head 1-2 feet below surface; 29.745 at West Pine River bridge 50 feet above stream = 678 feet; 29.745 a Germain's well, 403 feet deep = 678 feet; 29.745 at Rudyard Station at 9:45 a.m. = 685 feet; 29.725 at 10:45 a.m. = 685 feet;

29.705 at town line, corner Sections 5 and 6, 31 and 32 = 700 feet ±; 29.700 at Halbert's well in northeast part Section 31, T.45N., R.2W., at 11:00 a.m. = 700 feet ±

I am told the red clay extends 5 miles ± north of Dryburg. The hardwood tract north of Rudyard runs into the southeast corner Section 14, T.45N., R.3W. Dr. Ferguson of Rudyard says there is a sandy tract from the camp 4 miles east of Trout Lake north to Strong's Siding. Aneroid 29.675 at corners Sections 19, 20, 29 and 30. The boulders set in 1/4 mile north.

Aneroid 29.645 at dwelling in west part Section 20 at 11:20 a.m.; 29.600 at summit near where the road runs east at 11:30 a.m.; 29.600 at north edge of moraine near south side of Sections 7 and 8 = 785-800 feet; 29.630 at a terrane cut in north face; 29.655 at south edge of swamp north of the moraine = 740 feet ±; 29.690 at creek about a mile from the town line at 12:15 p.m. = 720 feet ±. There is a slight rise north of this, then a descent to a lower stream. Aneroid 29.705 = 700-710 feet. This is all a cedar swamp for 2 miles or more.

Aneroid 29.705 at 1:00 p.m. where a road that is travelled comes in from the east, 700 ±. There is red clay at surface from this road north but I saw none farther south. About 1/4 mile north of this east-west road I come to a deep ravine cut in the clay. Aneroid 29.745 at the bottom. The road seems to be on town line between T.45N., and T.46N. This clay plain has swampy places with huckleberry and tamarac.

Aneroid 29.720 at Walska River above dam at 1:45 p.m. = 675 feet ±; 29.690 at level of plain each side of river = 700 feet ±. There is an occasional granite boulder on the surface but the clay seems to be pebbleless. I find it calcareous at depth of 2-3 feet in road cuts 2 miles south of Brimley. The clay land is said, by residents, to extend 3-4 miles west of the road I am on. There is sand farther west near Wellsburg. Aneroid 29.675 at Brimley at 4:20 p.m. = 666.

There is a slight bank 1¼ miles south of Brimley that I suspect to be the equivalent of the cut bank at Fort Brady. It is only 6-7 feet high. It runs around to the southeast through Section 16 into Section 21. There was probably a bay up Waiska River as far as the bend at this stage of the lake. Possibly the sand along the railroad east of Brimley was deposited by this lake and not all blown up from the Lake Nipissing flats to the north.

Aneroid 29.675 at Brimley at 4:20 p.m. = 666 feet. I go west on railroad and am on a clay plain westward beyond the town line, aneroid 29.610 at town line, but enter sand within 1/2 mile west. There is some swampy land along the streams that may be underlaid with clay but aside from this it is all sandy land to Wellsburg.

Aneroid 29.500 at Wellsburg on pine plains = 825 feet. There was hemlock and beach, birch, etc. A well by the tank at Wellsburg is 280 feet--8-inch to 200 feet and 6--inch below--but one in ravine 20 rods south gets water at 25 feet. The deep well had no clay but was in

quicksand all tie way. The head is 44 feet below surface. The shallow well struck a boiling spring in gravel under the sand. It fills the well nearly to level of ground. There was fine, dry, white sand near top and bluish, loamy sand below, resting on the gravel. No use is made of the deep well. It was sunk about 1885.

On the plains north of Wellsburg, as far as Iroquois Point and east to brow of bluff, wells are 100 feet. A well on Robert Haynes place, near corners Sections 20, 21, 28 and 29, went 160 feet and got very little water.

A well on top of bluff in Section 25, T.47N., R.4W., on the old Van Leuven homestead, is 140 feet and got very little.

At Rexford is a deep well at station house that has very little water.

Mr. Frank Abrams in Section 3, T.45N., R.3W., says there is very little sand from his place except along the north branch of Pine River. There is a poplar strip along the river.

I go out to Mr. William Raymond's in northeast corner Section 30, T.44N., R.3W. This is on undulating land with a moderate number of boulders on surface. He says this kind of land runs through to Mr. Abrams in Section 3, west part. It is higher than land to the east. The flat clay extends west into Section 2, T.45N., R.3W. He thinks Charles Chapman of Sault Ste. Marie, the State Game Warden, can give the description of the land in T.45N., R.3W.

August 27, 1905.

I level up to the Nipissing beach and find it to be between 655 and 660 feet at Sault Ste. Marie east of Fort Brady. The Fort Brady beach is 17 feet lower than the base of stand pipe or 699 feet A.T. at base of cut bank. The water level of old lake can be taken at 700 feet. There is a storm beach outlined faintly back of this at 707-708 feet.

I level up to stand pipe westward from the main Nipissing shore and find it $10 \times 5\text{-}2/3 \times 2\text{-}2/3$ feet = 59-60 feet, 716; 60 = 656 feet A.T. I started the leveling at the upper limit of the boulder pavement here and at Fort Brady beach.

I go across to Canada and test clay in bluff 3 miles west of Sault Ste. Marie and find it calcareous. The bluff back of the Nipissing beach there rises a little above you feet but I do not see boulders above the level of the Nipissing such as occur at Fort Brady, nor do I find other shore features. The flat tract east of this hill along road running west from Sault Ste. Marie, Ontario, is coated with sand.

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Note: As shown in index, data for August 28, September 2, and September 4, 1905 are in Notebook 203 but the transcription has been included with that of Notebook 204.