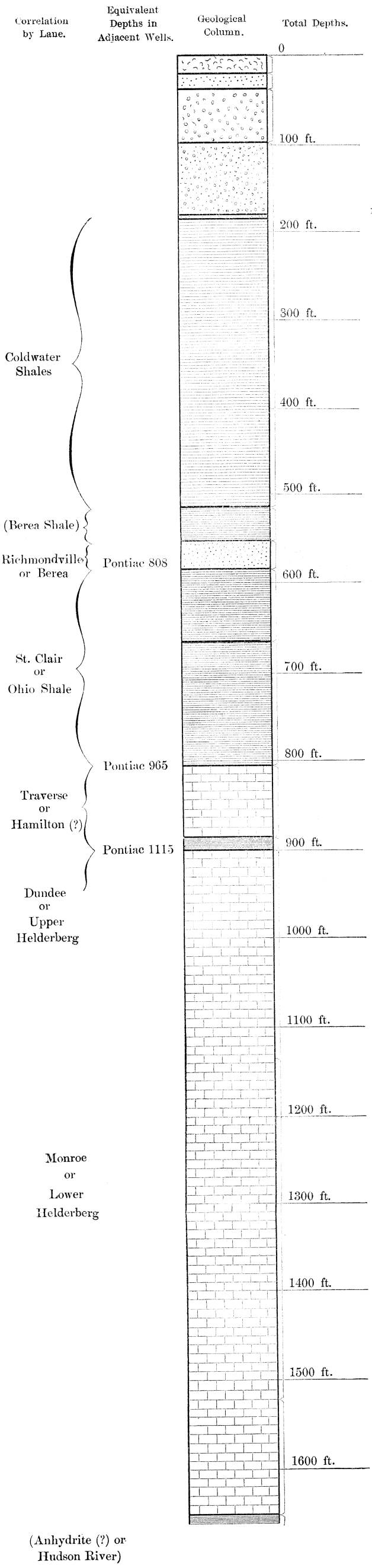
ADRIAN.

Lenawee Co., Alt. 810 ft.
Adrian Gas Co. Depth, 1650 ft.
C. E. Wright; no samples.



1- 20 Surface.
20- 38 Quicksand.
38- 98 Gravel.
98- 180 Gravel and quicksand.
180- 184 Sandstone, light grey.
184- 514 Soft white slate or sandstone.
514- 554 Brown slate.
554- 584 Grey sandstone.
584- 664 Brown slate.
664- 805 Brown shale.

Mineral water at 805.

805- 885 Reddish hard limestone. (Mouth of driving pipe 180 ft.; casing to 500, then the second time to 885.)

885- 900 Black slate or shale. Regular limestone at 900.

Sulphur water.

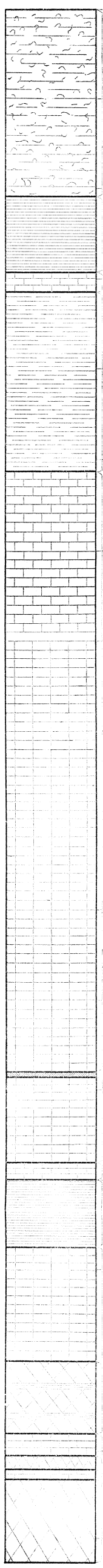
900-1650 Limestone, hard, dark drab to grey.

Brine.

Brine.

Slate rock, white and soft.

St. Clair Co., five miles below the town. Alt. 590 ft. (?)
Albert Miller. Depth 1727 ft.
C. E. Wright; begun in 1886, March 4th, finished June 20th.

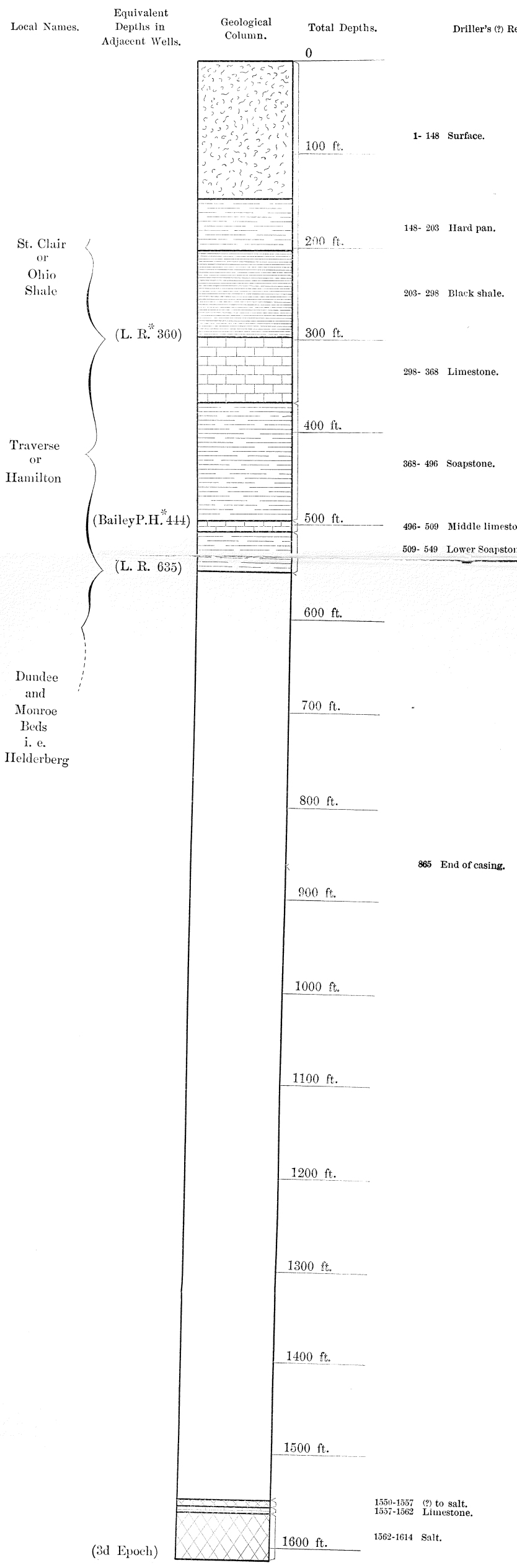


Local Names.	Equivalent Depths in Adjacent Wells.	Total Depths.	Driller's (?) Record.	
		0 Surface		
		100 ft.	1- 208	Surface, clay, etc.
		200 ft.		
			208- 293	Soft white shale.
		300 ft.	293- 313	Soft brown lime.
Traverse or Hamilton		400 ft.	313- 513	Soapstone, soft, grey and sticky.
	(L. R.* 635 Port L. 710)	500 ft.		
Dundee Beds		600 ft.		
		700 ft.		
Monroe Beds		800 ft.		
		900 ft.	513-1280	Hard, mixed grey and brown limestone. (N. B. The records of this well do not show the distinction between limestone and dolomite; which I have therefore separated in the sketch according to records elsewhere.)
		1000 ft.		
		1100 ft.		
(L. R. 1300)		1180-1185		Yellow gypsum,(probably anhydrite).
		1200 ft.		
(2d Epoch)				
		1280-1300		Hard, mixed grey and brown limestone.
		1300 ft.		
			1300-1375	Blue shale; medium hard.
		1400 ft.		
			1375-1500	Grey, brown and white hard limestone.
(3d Epoch)		1500 ft.		Rock salt.
			1500-1580	Shale and salt mixed; soft and hard.
		1600 ft.	1580-1605	Hard brown and white lime.
			1605-1623	Rock salt.
			1623-1633	Hard grey lime.
			1633-1727	Salt.
		1700 ft.		
			1727	Hard limestone.

L. R. refers to Lester and Roberts' well at Marine City.
Port L. refers to Port Lambton well.

ALGONAC.

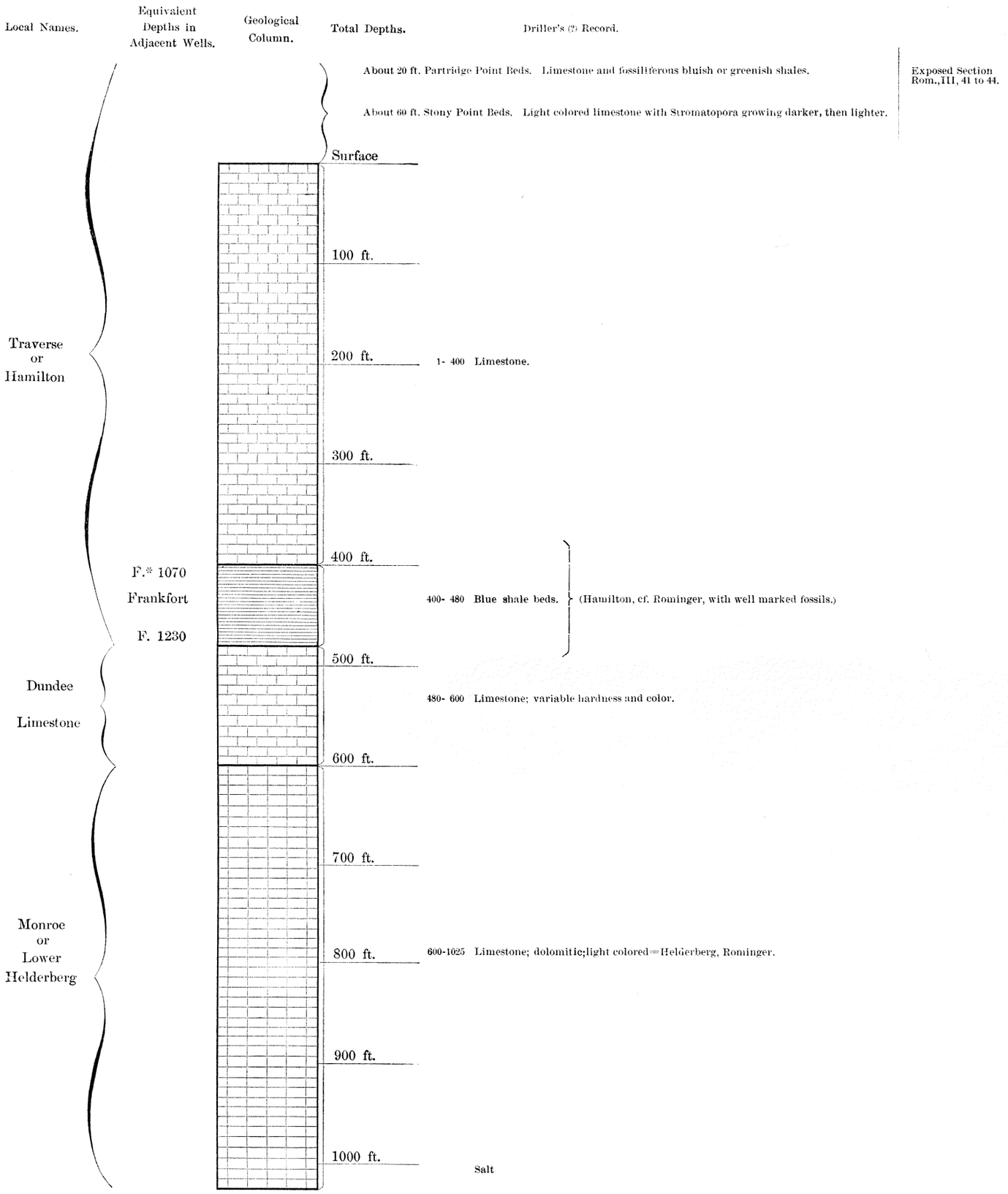
St. Clair Co., Alt. 600 ft. (?).
Algonac Salt Co. Depth 1614 ft. +
C. E. Wright.
Casing to 865 ft.; capacity 150 lbs. per day; also furnishes brine to Excelsior Salt Works.



Allegan Co., Alt. 708 ft.
Allegan Gas, Oil and Mining Co.
Julius C. Ellinger; samples examined by L.

Formations. Parallel Names in Ohio.	Local Names.	Equivalent Depths in Adjacent Wells.	Total Depths.	Driller's Record.	Sample Record.
			0		
				1- 120 Sand and clay.	
			100 ft.		
Quaternary				120 Gravel and flowing water.	
			200 ft.		
Marshall ?				Struck slate and sandstone, end of drive pipe.	255 Impure grey banded sandstone. 260 Pyritiferous bituminous coal. 275 Siderite. 295 Pyrite nodules and bluish shale.
			300 ft.	292 Salt water.	
				255- 331 Sandstone cased with 5⅝ inch pipe.	331 Brownish drab siderite, full of grains of calcite and pyrite, with traces of fossils.
			400 ft.		
				331- 580 Blue shale.	Greenish bluish non-fossiliferous shales.
			500 ft.		
		Charlotte 1150-1460			
			600 ft.	580- 595 Red rock. 595- 610 Blue shale. 610- 615 Red rock again.	Mixed red and green shale, calcareous red shale; residue of red clay, very little grit. Red, freely effervescing shale. 615 No effervescence, but turns from green to red with H Cl.
Waverly	Coldwater Shales	Muskegon 1200 Grand Rapids 1200 Kalamazoo 710			
			700 ft.		
				615- 990 Grey shale; fine drilling.	No effervescence; greenish and bluish grey shales.
			800 ft.		
			900 ft.		
		Charlotte 1700 Kalamazoo 1070 Benton Harbor 280			
			1000 ft.		
				990-1095 Black shale.	Burns on heating; bituminous shale.
Huron Shale	St. Clair Black Shales		1100 ft.		
				1095-1175 Hard rock; salt water between 1120 ft. and 1200 ft.	Siderite. $FeCO_3$. This may be merely a large nodule.
				1175-1195 Black rock or slate.	Bituminous black shale.
		Kalamazoo 1200	1200 ft.	1195-1205 Limerock.	Mixture of dolomite and black shale.
Hamilton	Traverse			1205-1260 Blue shale. 1245 Oil; crust very hard; turned drill. 1264 Oil. 1275 Bottom of No. 1.	1205-1260 Greenish or bluish grey shale, slowly effervescing. 1260-1264 Also a piece shot out. 1275 Sandy limestone, light buff.
		Charlotte 1985 Grand Rapids 1775			
		Kalamazoo 1270 Benton Harbor 665			1275-1300 1300-1350 These three alike, light yellow limestones, rapidly effervescing, containing white chert and fragments of darker grey pyritiferous seams; also brachiopod fragments (?), either Leptocaelia acutiplicata or Spirifera gregaria. 1350-1400
			1300 ft.		
Upper Helderberg	Dundee				
			1400 ft.		

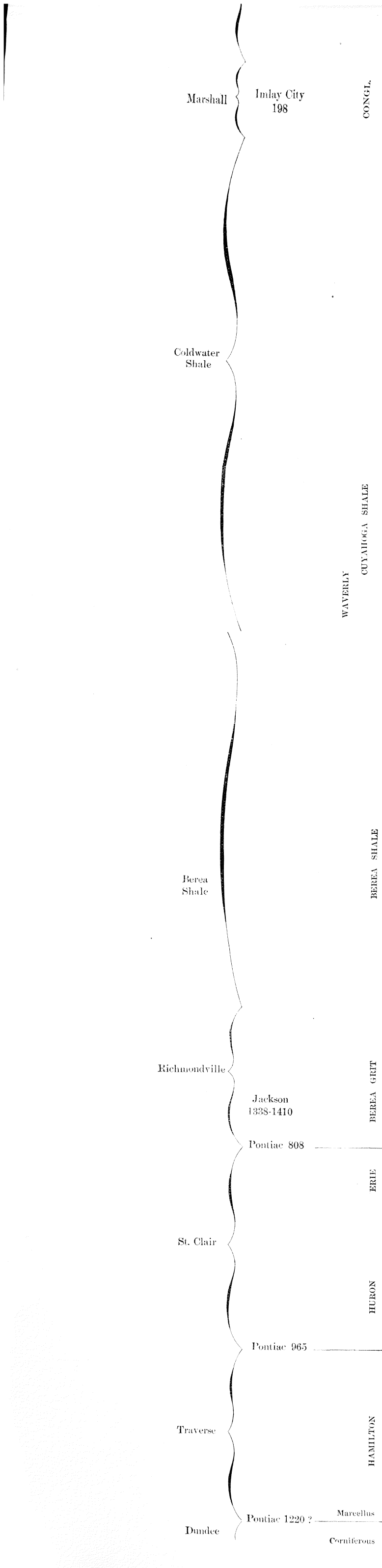
Alpena Co., Alt. 609 ft. ***(Near Bed of Thunder Bay River.)***
Depth 1025 ft.
Rominger, III, p. 39 et seq.
C. E. Wright (?).



*** F. refers to well at Frankfort.**

Bay Co., Alt. 592 ft.
Bored by John Mason.
Depth 2865 ft., or from Wright's notes in one other place, 2262½ ft.
C. E. Wright and Bay City Tribune in 1885-86.

Local Names. Correlation by Lane.	Equivalent Depths in Adjacent Wells.	Formations. Parallel Names in Ohio.	Geological Column.	Total Depths.	Driller's Record.
				0	
					1 - 85 Sand and clay.
				100 ft.	85 - 120 Hard pan.
				200 ft.	
					120 - 420 Blue shale.
				300 ft.	
Jackson Coal Group		SHALE		400 ft.	
				500 ft.	420 - 565 Sandy shale.
					565 - 585 Limerock to brine 85°. Carboniferous limestone (?).
Parma ?		LOGAN SERIES SANDSTONE		600 ft.	585 - 635 Sandrock; brine 15 ft. to 55 ft.
					635 - 660 Sandy shale.
					660 - 700 Blue shale.
				700 ft.	700 - 712 Gypsum; white; 6 in. casing to 722.
Grand Rapids					712 - 820 Blue shale.
				800 ft.	
					820 - 830 Hard limerock.
Marshall	Imlay City 198	CONGL.			830 - 920 Sandstone; brine to 100°; Napoleon.
				900 ft.	
					930 - 955 White shale.
				1000 ft.	
					955 - 1055 Red shale.
					1055-1105 Blue shale.
				1100 ft.	
					1105-1145 Limestone.
					1145-1220 Hard blue shale.
				1200 ft.	
Coldwater Shale					1220-1285 Blue limestone.
				1300 ft.	
					1285-1390 White shale.
				1400 ft.	
		CUYAHOGA SHALE			1390-1510 Sand shale.
				1500 ft.	
					1510-1530 Blue shale.
					1530-1548 Hard limestone.
		WAVERLY		1600 ft.	
				1700 ft.	1548-1748 Blue shale.
					1748-1798 White shale.
				1800 ft.	
					1798-1833 Black shale.



712 - 820 Blue shale.

820 - 830 Hard limerock.

830 - 920 Sandstone; brine to 1000; Napoleon.

930 - 955 White shale.

955 - 1055 Red shale.

1055-1105 Blue shale.

1105-1145 Limestone.

1145-1220 Hard blue shale.

1220-1285 Blue limestone.

1285-1390 White shale.

1390-1510 Sand shale.

1510-1530 Blue shale.

1530-1548 Hard limestone.

1548-1748 Blue shale.

1748-1798 White shale.

1798-1833 Black shale.

1833-1898 Black limestone.

1898-1913 Brine-bearing sandstone.

1913-1983 White shale.

1983 2033 Hard limestone.

2033-2048 Soft black sand.

2048-2093 Hard blue shale at 2067.

2085 Black oily shale, 15-20 ft. thick.

2093-2118 Very hard limestone; 5⅝ in. bore to 2120 and 5½ in. below.

2118-2133 Sandstone.

2133-2141 Grey limestone. 2140 Pumped clean sand.

2141-2306 Sandrock with salt brine. 100°, overflowing top.

2262½ ft. deep, stopped in blue shale.

1720 Below sea level.

2306-2371 White shale.

2371-2585 Black oily saudy shale.

2585-2685 Black hard limestone.

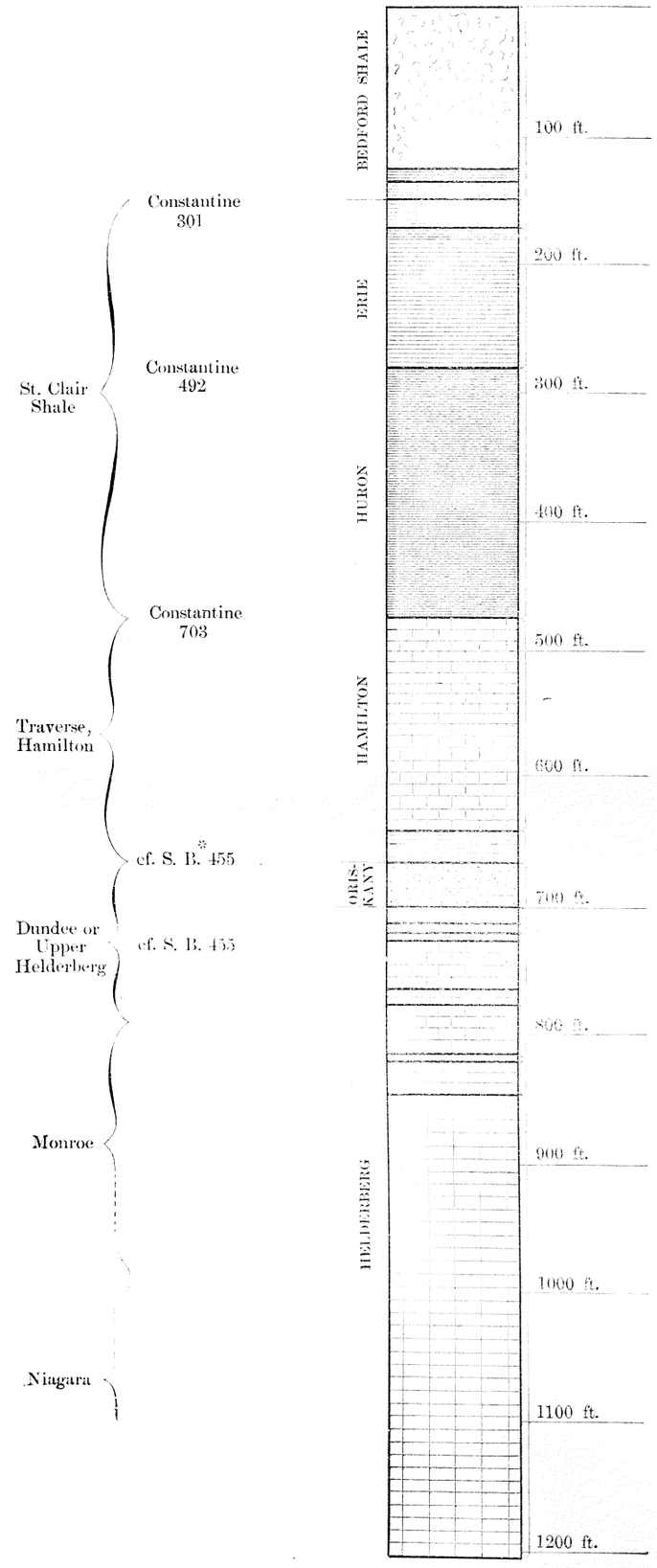
2685-2775 Grey lime-rock.

2775-2822 Blue shale, quite hard.

2822-2852 Sandy limestone, VERY HARD.

2852-2865 Lime-rock.

Berrien Co. Alt. 600 ft.
Benton Harbor Natural Gas and Oil Co. Depth 1205 ft.
Samples from Fred. Jordan; C. E. Wright, Dr. Rockwell.

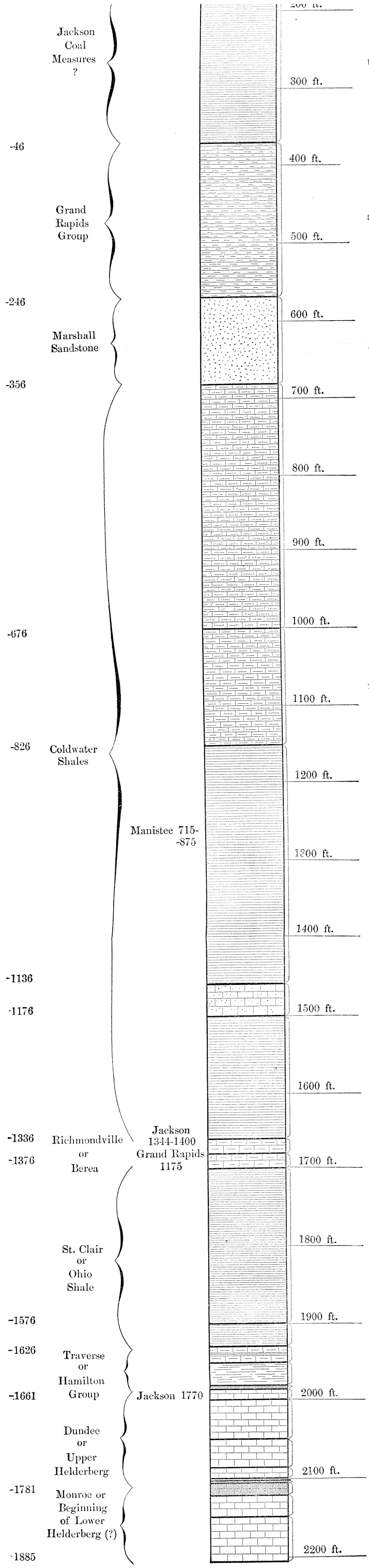


Driller's Record.		Sample Record.
	135	Bluish grey argillaceous shale.
135- 150	Red shale	Chocolate brown shale, ef. in cold HCl; 70 per cent residue. Under microscope, fine fringy argillaceous mass and small granules; does not depolarize the light.
150- 170	Light blue shale; quite hard; effervesces slightly; large residue, finely granular, apparently isotropic.	
170- 280	Blue shale or slate ?).	No sample.
280- 475	Black shale or slate.	
475- 640	Argillaceous limestone; dark bluish drab; contains iron pyrites; brisk effervescence; 50 per cent residue of a fringy clay mass.	
640-665	Calcareous argillaceous shale; dark drab; medium hard; brisk ef; 70 per cent residue of clay.	
665- 700	Arenaceous limestone; dark drab; brisk ef.; 20 per cent residue of rounded glassy grains of sand.	
700- 706	Limestone, greyish white mixed with dark drab; brisk ef.; 10 per cent residue, mainly isotropic.	
706- 711		
711- 720	Porous limestone; light grey; brisk ef.; 2 per cent residue of a finely granular mass.	
720- 725	Greyish limestone; brisk ef. in cold acid, 10 per cent residue of round glassy grains of sand (and bits of green shale; no anhydrite.)	
725- 735		
735- 741		
741- 750	Dark drab to light drab limestone; brisk ef.; 5 to 10 per cent residue of rounded grains of sand.	
750- 755	755- 764	
764- 778	Light grey limestone; brisk ef.; 2 to 8 per cent residue of rounded glassy grains of sand.	
778- 788	Brisk effervescence.	
788- 800	Limestone; drab; brisk ef.; 20 per cent residue of sand and gypsum.	
800- 806		
806- 815		
815- 820	Marly gypsum; very light grey; 80 per cent residue of anhydrite and a few grains of silica.	
820- 832		
832- 846	Dolomitic limestone; drab; resembles sand; slight ef. in cold acid; 10 per cent residue of rounded glassy grains of sand, anhydrite and gypsum.	
846- 858		
858- 900		
940	(Like 900-1205. L.)	
900-1205	Dolomite; slow ef. in cold acid; 3 to 20 per cent residue of grains of greyish sand.	

ABBREVIATIONS.
Ef.=Effervescence.
HCl.=Muriatic Acid.
***S. B.=Well at South Bend, Ind.**

Eaton Co., Alt. 906 ft.
Depth 2209 ft.
E. Sheperd and F. W. Higby. Cf. Rominger, III, 130 and 131; also the Hillsdale well.
Samples examined by Lane.

Depth Above or Below Sea Level.	Local Names.	Equivalent Depths in Adjacent Wells.	Geological Column.	Total Depths.	Sample Record.
324					
					Surface.
+ 252					
	Woodville or Parma Sandstone			100 ft.	72- 160 Fine sandrock. S. Mainly quartz sand, with a very little calcite and larger bits of dark bluish grey shale.
+ 164				200 ft.	
	Jackson Coal Measures ?				160- 370 Fine shale. S. Quite dark bluish, with black specks, (fossiliferous?), very finely divided quartz, much clayey matter and but a trace of calcite.
				300 ft.	
-46					
				400 ft.	
	Grand Rapids Group				370- 570 Fine sandrock. S. A somewhat sandy, medium *grey shale;* no reaction for gypsum; a trace of calcareous matter. There are some fragments very fine-grained, but quite gritty.
				500 ft.	
-246					
				600 ft.	
	Marshall Sandstone				570- 680 Soft sand. S. Fine grained; quite *calcareous;* greenish grey *sandstone*, showing under the lens distinctly the rounded grains of colorless quartz. One larger piece shows distinctly the greyish or greenish white sandstone, with the rounded quartz-sand and occasional specks of mica.
				700 ft.	
-356					
				800 ft.	
					680-1000 Shale and sand. S. *Argillaceous limestone*, with a little quartz and green earth; greenish grey.
				900 ft.	
				1000 ft.	
-676					
				1100 ft.	1000-1150 Shale and sand. S. Much like the preceding 320 ft. *Calcareous shale*, effervescing briskly.
-826	Coldwater Shales	Manistee 715--875			
				1200 ft.	
				1300 ft.	1150-1460 Soft sand. S. Much of the matter greenish grey argillaceous, as in previous samples, but there are also larger fragments of siderite or *dolomite*, often brownish. These may represent nodules of kidney iron ore.
				1400 ft.	
-1136					
-1176				1500 ft.	1460-1500 Sand and slate. S. Somewhat sandy limestone; contains some brown and white mica.
				1600 ft.	1500-1660 Soft slate. S. Calcareous shale with traces of quartz.
-1336	Richmondville or Berea	Jackson 1344-1400 Grand Rapids 1175			1660-1680 Hard sand. S. Gritty calcareous shale. { In the whole preceding section there is no distinct break.
-1376				1700 ft.	1680-1700 Red rock. S. *Calcareous red shale;* gritty; ferruginous.
	St. Clair or Ohio Shale			1800 ft.	1700-1900 Shale. S. *Black shale*, with occasional harder reddish fragments, barely calcareous.
-1576				1900 ft.	
					1900-1930 Shale. S. Brownish black *bituminous shale*, non-calcareous; burns with an aromatic smoke.
-1626	Traverse or Hamilton				1930-1950 *Shale.* S. Shows frequent pyrite; black bituminous and grey grains, slightly calcareous.
					1950-1980 Shale. S. Grey calcareous shale with bits of calcite from fossils.



Jackson Coal Measures ?

-46

Grand Rapids Group

-246

Marshall Sandstone

-356

-676

-826 Coldwater Shales

Manistee 715-875

-1136

-1176

-1336 Richmondville or Berea

-1376

Jackson 1344-1400
Grand Rapids 1175

St. Clair or Ohio Shale

-1576

-1626 Traverse or Hamilton Group

-1661

Jackson 1770

Dundee or Upper Helderberg

-1781 Monroe or Beginning of Lower Helderberg (?)

-1885

160- 370 Fine shale. S. Quite dark bluish, with black specks, (fossiliferous?), very finely divided quartz, much clayey matter and but a trace of calcite.

370- 570 Fine sandrock. S. A somewhat sandy, medium *grey shale;* no reaction for gypsum; a trace of calcareous matter. There are some fragments very fine-grained, but quite gritty.

570- 680 Soft sand. S. Fine grained; quite *calcareous;* greenish grey *sandstone*, showing under the lens distinctly the rounded grains of colorless quartz. One larger piece shows distinctly the greyish or greenish white sandstone, with the rounded quartz-sand and occasional specks of mica.

680-1000 Shale and sand. S. *Argillaceous limestone*, with a little quartz and green earth; greenish grey.

1000-1150 Shale and sand. S. Much like the preceding 320 ft. *Calcareous shale*, effervescing briskly.

1150-1460 Soft sand. S. Much of the matter greenish grey argillaceous, as in previous samples, but there are also larger fragments of siderite or *dolomite*, often brownish. These may represent nodules of kidney iron ore.

1460-1500 Sand and slate. S. Somewhat sandy limestone; contains some brown and white mica.

1500-1660 Soft slate. S. Calcareous shale with traces of quartz.

1660-1680 Hard sand. S. Gritty calcareous shale. } In the whole preceding section there is no distinct break.

1680-1700 Red rock. S. *Calcareous red shale;* gritty; ferruginous.

1700-1900 Shale. S. *Black shale*, with occasional harder reddish fragments, barely calcareous.

1900-1930 Shale. S. Brownish black *bituminous shale*, non-calcareous; burns with an aromatic smoke.

1930-1950 *Shale.* S. Shows frequent pyrite; black bituminous and grey grains, slightly calcareous.

1950-1980 Shale. S. Grey calcareous shale with bits of calcite from fossils.

1980-1985 Shale and lime. S. Highly fossiliferous shale full of bits of brachiopods (?) and of black matter.

1985-2000 Top of limestone. S. Grey limestone, briskly effervescing.

2000-2050 Brine { Sp. wt. 1.198. / Salin. 97°. } Limestone. S. Salt brine (Sp. wt. 1.198=97 per cent) at 2050; effervesces briskly, with a cherty residue and a little quartz. All these limestones down to 2121 ft. are *yellowish* or *buff*, ferruginous with magnetite.

2050-2085 Limestone. S. Effervesces very briskly.

2085-2100 Limestone. Acid water in it. S. Effervesces briskly; residue of cherty dolomite, quartz, magnetite and pyrite.

2100-2102 Limestone; hard water under it. S. Effervesces briskly; residue of chert, quartz, green grains, with iron rust, magnetite and pyrite.

2100-2105 Limestone. S. like previous sample, residue larger.

2105-2121 Limestone. S. damp, reacts faintly for sulphates (gypsum), like previous sample.

2121-2150 Limestone. S. Buff to grey, with little fragments of iron ore in thin seams (hematite; magnetic), but little quartz and no chert.

2150-2209 Limestone. S. Buff to grey; slight residue of chert and quartz.

ABBREVIATIONS.—S. Sample.