

NOTES ON SANGAMON COUNTY LIMESTONES.

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The following information was furnished by diamond drill cores from a drilling made some years ago at Divernon, sent two years ago to the State Museum and just made accessible for study and exhibition.

For stratigraphic investigation it is true that drill cores are small, are deficient in weathered fossils, and lack the prominent features of outcropping ledges. But they have the advantage of presenting for examination every foot of strata underlying a given point and showing the exact location of the various strata in relation to each other. While clays and soft shales are washed out by the water used in keeping the drill hole clean, their thickness is recorded and samples show their character.

Divernon is seventeen miles south of Springfield and about two miles from the south line of Sangamon County. The boring began at about 600 feet above sea level and ended at a depth of 604 feet. First it went through 9 feet of loess, 15 feet of "Illinoian" till and 16 feet of "Kansan" till, and at a depth of 40 feet reached the rock, a limestone. This limestone and all the subsequent strata encountered constitute the upper half of the

* The words in italics have been added by the author.

The accompany table shows the result of the examination:

No.	Depth.	Thick- ness.	Color.	Streak.	H.	Tough- ness.	Residue.	Fossils.	Remarks.
1	40	5'	White, mottled	White	3.5	Tough	.5	Rare	Brecciated and recemented
2	45	3'	Rusty	Gray	3.2	Tough	11	Fossils	Rusty
3	58	4'	Drab	White	3	Tough	4.4	Few fossils ("Carlville" L. S.?)	Outcrops at Croll's Mill
4	71	1'	Gray	White	3	Tough	4.5	Crinoids, Brachiopods (Productus)	8 M. S. of Springfield, Old State House constructed of it
5	75	3'	Brown	Brown	...	Friable	40	Rich in fossils	Sandy
6	149	8"	Black	Black	3.1	Crumbly	17.5	Rich in fossils	Outcrops at Riverton, east of Spring- field
7	160	2'	Black	Black	3.2	Medium	39	Rare fossils	.....
8	270	1'	Black	Drab	...	Medium	10	.....	.....
9	292	1'	Brown	Drab	3.4	Tough	18.5	.....	Cracks like mud when powder is dried; chert concretions
10	296	4'	Buff	Drab	...	Tough	33	.....	Clayey, carbonaceous
11	300	5'	Buff	Drab	3.4	Medium	23	.....	Brecciated
12	317	3'	Black	Black	2.9	Crumbly	60	.....	Compare
13	348	2'	Light	Greenish	3.5	Tough	34	.....	Shaly, fine bedded
14	373	3'	Light	Black	...	Tough	13	.....	.....
15	418	1'	Brown	Brown	...	Soft	64	.....	.....
16	425	1'	Brown	Brown	...	Soft	22	Fossiliferous	.....
17	435	1'	Brown	Brown	...	(Solid piece of sandy shale passing with no visible line of demarkation into limestone with pronounced effervescence)	20	Small brachiopods numerous. Immediately below the limestone, with no clay or shale intervening, occurs the 4" coal bed (No. 1) underlain by tight shale	.....
18	553	22"	Dark	Brown	Tough	.....	.....	.....	.....

Carboniferous system known as the Pennsylvanian, inasmuch as it was first studied and best exemplified in Pennsylvania. The drill passed through the top series (the Upper Productive), the middle series (the Lower Productive) and sank about 25 feet into the bottom series (the Mansfield). To differentiate between these series is difficult, since they merge into each other insensibly. But somewhere the line of demarkation is passed.

Eight beds of coal (ten different layers) were encountered. The top one (9 inches thick), No. 8 of the old geological survey, is only 151 feet from the surface. The bottom one, No. 1 (4 feet 5 inches thick), is 555 feet from the surface. All of the beds together aggregate 23 feet and 3 inches.

I examined every foot of the core for limestone and found eighteen different layers, varying from 6 inches to 5 feet in thickness and giving a total of only 46 feet of limestone in the 600 feet of strata penetrated. This is a small amount.

At eighteen places the cores showed limestones by effervescence in cold dilute hydrochloric acid. These sections were numbered, beginning at the top, and samples taken. The beds vary from 6 inches to 5 feet in thickness. There is great disparity between the amount of intervening strata. In some cases a stratum of limestone of one character follows immediately below one of another character. Again, these are far apart. For example, between beds No. 7 and No. 8 are 110 feet of shales with no intervening limestone and between No. 17 and No. 18 even a greater amount, 117 feet, of shale and sandstones, totally devoid of limestone. Below No. 7 the Upper Productive may be said to end, and below No. 18 the Lower Productive ends. The Mansfield sandstones and conglomerates begin about 40 feet below the lowest coal. The distance between the beds are as follows: 0, 10, 9, 3, 71, 10, 110, 21, 3, 0, 12, 27, 23, 40, 5, 9, 24, 117 feet.

The colors are usually grey with light bluish spots, rusty, brown, and black. The streak varies from white through dark buff to black. All are of light specific gravity and in hardness vary from 3 to 3.5. Beds Nos. 1 to 4, No. 9, and Nos. 13 and 14 are tough. The others are friable or fissile, like soft shale.

One hundred milligrams of each of the eighteen were dissolved in cold hydrochloric acid and after 12 hours the residues were weighed. No. 1 was the most completely dissolved. The residue weighed but $\frac{1}{2}$ of a milligram. No. 15 proved to be the least soluble, 64 per cent remaining in the test tube. Beginning with

the most soluble and ending with the least soluble, the arrangement is as follows: No. 1 (residue .5 mg.), No. 3 (residue 4.4 mg.), No. 4 (residue 4.5 mg.), No. 8 (residue 10 mg.), No. 2 (residue 11 mg.), No. 14 (residue 13 mg.), No. 6 (residue 17.5 mg.), No. 9 (residue 18.5 mg.), No. 18 (residue 20 mg.), No. 16 (residue 22 mg.), No. 11 (residue 23 mg.), No. 10 (residue 33 mg.), No. 13 (residue 34 mg.), No. 7 (residue 39 mg.), No. 5 (residue 40 mg.), No. 12 (residue 60 mg.), No. 17 (residue 64 mg.).

At a depth of 440 feet a 4-foot bed of a tough white, hard rock, called limestone in the drill record,¹ is encountered. In cold hydrochloric acid it is almost insoluble, leaving a residue of 80 per cent. It is a siliceous dolomite.

It is interesting to note that bed No. 18, very rich in small brachiopods, lies *immediately above* Coal No. 1 at a depth of 453 feet. In the drill record this is called Dark Shale. To find a limestone roof without intervening shale or clay is an unusual occurrence.

¹ Report on the Progress and Condition of the Illinois State Museum of Natural History for the years 1909 and 1910, p. 32.