

depth so many hundred times as would be necessary to produce all the variations to be read in a thickness of five hundred feet. Pure limestones are made in the deeper waters and fine argillaceous sediments may settle in the deeper or the shallower places.

But there appears to be ample reasons for believing that the sea in which the Hudson River rocks of Indiana and Ohio were deposited had its shore line far away, or in other words, said localities were near the middle of a continental ocean.

How then can we account for such well defined successions of mechanical deposits for so long a period of time? How could these sediments get so far from shore and how could they recur so sharply bounded as they are from the purer limestone and other consolidated ledges? How came it about that there were such numerous alternations of life and death epochs in the same fifty, or five hundred feet? The answer to these questions may be very easy to some geologists. We have not, however, seen them satisfactorily answered. Their solution, whatever it is, will be the opening of a door to other secrets.

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THE TRAPS OF REDHEAD, N. B. By V. F. MARSTERS.

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EXHIBITION AND EXPLANATION OF A GEOLOGICAL CHART. By ELWOOD P. CUBBERLY.

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GLACIAL AND PREGLACIAL EROSION IN VICINITY OF RICHMOND, IND. By JOSEPH MOORE.

Richmond is on Drift, underlaid by upper layers of Lower Silurian known as rocks of the Hudson River Group. These rocks being of the earlier time have been above the sea for ages. Consequently there was plenty of time for them to be much eroded. I shall not in this brief paper specify all the well-marked features of erosion but will allude to a few special examples. There is a buried river channel a few rods west of the present channel of Whitewater. This was reported nearly fifty years ago by Dr. Plummer, of Richmond, but it was not then so well known in its extent and direction as it has since become by means of wells, tile layers and ditches for water and gas mains. Said buried channel is about seventy feet wide where crossed by the national road and its walls are very

nearly vertical. In general direction it lies nearly north and south, approximately parallel to the present channel and is of unknown depth. It is filled with sand, gravel, clay and bowlders, with remains of leaves and sticks here and there. It is believed to have been rather a new channel when filled since the upper edges of its vertical walls were not worn down and rounded. It may have been, and probably this part of it was, eroded during an interglacial period. There is a much narrower channel at a shorter distance on the east side of the present river channel as exposed by the deepening of Main street leading westward from town.

A feature little, if at all, reported in Indiana, so far as the writer has observed, is that of great "pot holes" or "glacial jugs" or "giant kettles."

A few years since Mr. Starr, the proprietor of the gas works, called me over to see one of these where he was excavating in the solid rock for a very large cistern.

In one of the walls was a section of the "jug." It was some ten feet in diameter and about the same depth was exposed, though it extended deeper than the cistern. It was filled with clean sand and gravel beautifully assorted and stratified and near the lowest part exposed were bowlders two feet in diameter finely smoothed and rounded. The walls of this pot hole, which was much the shape of a great jug, were as smooth and polished inside as if the sand and gravel, with the pouring in of a torrent, had been on the whirl for a century. A few years later and about twelve rods from the same place, the city, while cutting into the south wall of Main street near the present river channel in order to widen and straighten the street, struck another jug. This last one was more funnel shaped, but had its sand worn bowlders and smooth sides as in the first.

Though not at the southern limit of glaciers in Indiana we are in the line of a terminal morain as indicated by bowlders and till. These pot-holes may be the result of the glacier having been stationary or nearly so for a length of time.

As a further phenomenon, lately the matter brought to light by a recent railroad cut, and somewhat in the same connection, may be mentioned a line of masses of Clinton limestone which some have supposed to be outliers in situ. These are about two miles southwest from the central part of Richmond and within five minutes walk of Earlham college.

Recent facts seem to indicate that these masses, jutting out here and there for more than three hundred yards, instead of being outliers and in their original place, are really masses of rock moved on for miles by the

glacier. (It is but a few miles north to where Hudson River rock dips under upper silurian.) Evidences that they are masses of Drift are found in the irregular way in which the rocks lie at all angles, and in the fact that where the lower rock is exposed in the cut the under side is glaciated as if by moving over other rocks.

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RELATION OF KINGS COUNTY TRAPS TO THOSE OF CUMBERLAND COUNTY, N. S.

By V. F. MARSTERS.

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AN ACCOUNT OF VEGETABLE AND MINERAL SUBSTANCES THAT FELL IN A SNOW STORM IN LAPORTE COUNTY, JAN. 8-9, '92. By A. N. SOMERS.

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SOME POINTS IN THE GEOLOGY OF MT. ORIZABA. By J. T. SCOVELL.

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BRITISH COLUMBIA GLACIERS. By C. H. EIGENMANN.

An account was given of the ascent of "The Glacier" in the Selkirks in British Columbia. A number of photographs were shown of the foot of the glacier.

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TWO-OCEAN PASS. By BARTON W. EVERMANN.

[ABSTRACT.]

It was probably in Pliocene times that the great lava-flow occurred in the region now known as the Yellowstone National Park, which covered hundreds of square miles of a large mountain valley with a vast sheet of rhyolite hundreds, perhaps in places, thousands of feet thick. It is certain that such streams and lakes as may have exist'ed there were wiped out of existence, and all terrestrial and aquatic life destroyed. It must have been many long years before this lava became sufficiently cooled to permit the formation of new streams; but a time finally came when the rains,