

fourths of an inch in diameter. The gravel is well rounded, and consists of Laurentian and limestone pebbles not dissimilar from those usually found in a corresponding position in other parts of this district. The "hard pan," while evidently representing the boulder-clay, is unusually pale in colour, being apparently largely composed of limestone debris. The thickness of the boulder-clay is also much less than usual. Its microscopic character has already been described, in connection with that of other similar materials of the same age, in a paper presented to the Chicago Academy of Sciences.¹ The predominant mineral constituents which remain, after the finer clayey matter has been washed away, are rather coarse quartz grains, of which nearly one-half are perfectly rounded. Bottle-green fragments of hornblende are moderately abundant, as are also grains of felspar and limestone, but laminated shaly materials are almost altogether wanting. It also contains a few specimens of foraminifera, which have been derived from some not far distant Cretaceous beds. These include a Textularia of the type of *T. globulosa*, with fragments of Rotalidæ and other forms.

Of the deposit described as "boulders" no specimens were obtained.

The beds underlying these superficial deposits, from No. 6 to No. 13 inclusive, are supposed to represent the Maquoketa shales. Their character is as follows:—

No. 6. This is a moderately firm greyish-green shale, with minute reddish laminae and some thin films of pyrites parallel to the bedding. It is not calcareous, and under the microscope is found to contain a considerable proportion of partially rounded quartz grains, but no fragments were observed of hornblende or other green or dark minerals usually found in the boulder-clays and other drift deposits.

No. 7. This limestone is cream or buff coloured, and rather coarse. It effervesces freely in cold dilute acid. It is, apparently, easily friable, as the sample received was in the form of coarse sand.

No. 8. A soft shale of general reddish colour, but holding also purplish and greenish layers, and showing under the microscope much subangular grit.

No. 9. Resembles No. 6, and is a rather firm yellowish-grey shale, showing under the microscope a considerable proportion of partly-rounded, somewhat coarse quartz sand in a brownish argillaceous matrix.

No. 10. The specimen of this rock consisted largely of cream-coloured limestone in small fragments, but more than half of it is of coarse quartz sand. This might have been derived from the friction of the boring rods against the upper portion of the sides of the hole, but is unlike any met with in the overlying deposits. It is probably interbedded with the limestone, but no calcareous cement was observed to adhere to the grains. The sample included one small piece (about half an inch long) of coarsely granular whitish gypsum.

No. 11. This is a fine-grained calcareous sandstone or sandy shale, rather hard, and noticeably finer and more siliceous than No. 6. The only organic traces met with in these rocks were found in this layer. They consist of thin, dark-coloured corneous-looking laminae seen on the surfaces of small fragments. Portions which were removed, and microscopically examined, showed occasional regularly disposed systems of bifurcating canals, closely resembling some of those figured and described by Bowerbank as occur-

¹ Bulletin, Chic. Acad. Sci., No. 6, Vol. I, 1885.