J. B. TYRRELL ON THREE

boine river, from the mouth of Arrow river to the vicinity of Oak lake, on the Canadian Pacific Railway, and near the latter place was found to contain a few fragmentary fish remains, with the shell of an Ostrea ?, and impressions of portions of the prismatic shell of Inoceramus. Prof. Culver¹ also states that similar shale outorops as far south as La Moure, near the south line of North Dakota, and that in it he succeeded in finding a few fossils, the best an Inoceramus, and casts of a little Baculite. These observations clearly prove an extensive areal development for this series of brittle light grey clay shales, and also that it belongs to the marine Cretaceous of the Western Plains. As was stated in the introduction, it is overlain by the coarse Laramie ? sandstones of the base of the Turtle Mountains.

No. 6.—A considerable flow of water was obtained from this thin band of sandstone. The almost utter absence of sandstone in the Pierre of this section is very noticeable, since sandstone enters so largely into the composition of the same formation farther west.

No. 7.—Apparently the same as No. 5, giving the Odanah series a thickness in this well of 290 feet.

Nos. 8 and 9.—In all probability these are both included in the Millwood series, representing the lower dark-grey shales of the Pierre formation. The "boulders" are nodules of calcareous ironstone such as are found in abundance in this formation on the banks of the Assiniboine river, in the vicinity of Mill wood. Some shells of spiral gasteropods are stated to have been found at a depth of 845 feet, but none were seen by the writer.

No. 10.—This band has been placed at the base of the Millwood series, which thus is given a thickness of 664 feet, but some or all of it may more properly belong to the top of the underlying Niobrara formation. If it were given the latter position it would represent the band of dark unctuous clay with much carbonaceous matter, etc., that is placed at the top of the Niobrara formation in Messrs. Meek and Hayden's Missouri section. A specimen from 1010 feet consists in part of a soft blueish-grey clay shale, and in part of a light grey clayey limestone. Another specimen from near the same depth contains a considerable amount of crystalline pyrite.

No. 11.—A very dark grey soft unctuous and very slightly calcareous clay shale, containing a few fragmentary remains of fishes, and at the top few foraminifera (Anomalina sp.), with the cells filled with pyrite. Mr. Hoffmann, of this Survey, states that the loss from this rock on ignition is 18 per cent, representing the amount of carbonaceous matter and water in the dried material.

This band has been placed at the top of the Niobrara formation in the section, as it is the highest bed from which foraminifera have been definitely recognized.

No. 12.—A mottled grey calcareous shale or marlite, containing, in varying numbers, foraminifera, prisms of the shells of Inoceramus, fragments of fish remains, crystalline masses of pyrite, occasional fragments of the pearly shells of Ostrea, and crystals of selenite. The following list gives the results of the examination of the specimens from every five (or ten) feet :—

- 1075. Slightly calcareous shale, with fish remains, a few foraminifera, Inoceramus prisms, and crystals of selenite.
- 1080. Soft moderately calcareous dark-grey mottled clay shale, with small crystals and crystalline masses of pyrite.

¹ A report on the preliminary investigation to determine the proper location of artesian wells, etc. U.S. Senate Document, No. 222, Washington, 1890, p. 59.