reactions indicated by these nodules as taking place on the sea-bottom, reference may be made to a still more remarkable discovery made by Messrs. Murray and Renard in the course of their examinations of the materials brought up from the same abysmal deposits. Minute crystals, simple, twinned, or in spheroidal groups, which occur abundantly in the typical red clay of the central Pacific, have

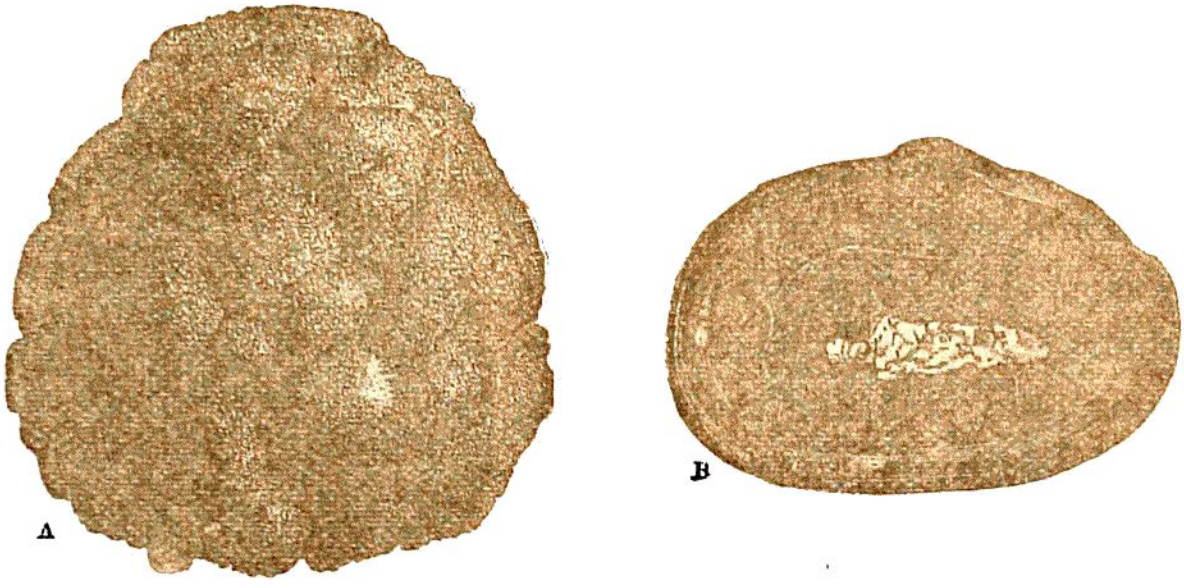

Fig. 175.—Manganese Nodules; floor of the North Pacific. Two-thirds natural size.[309]

A, Nodule from 2900 fathoms showing external form. B, Section of nodule from 2740 fathoms, showing internal concentric deposit round a fragment of pumice.

been identified with the zeolite known as christianite. These crystals have certainly been formed directly on the sea-bottom, for they are found gathered round abysmal organisms, and their production has been effected at about the temperature of 32° Fahr. The importance of this fact in reference to the chemistry of marine deposits is at once obvious.

Buchanan as to the mode of origin of the marine manganese deposits. See R. Irvine and J. Gibson, Proc. Roy. Soc. Edin. xviii. 1891, p. 54.

[309] These and Fig. 174 are taken from plate xxxiii. of the vol. on "Deep-Sea Deposits" in the Reports of the "Challenger" Expedition. The detailed investigation by Messrs. Murray and Renard of the deep-sea deposits obtained by this expedition forms the most important contribution yet made to our knowledge of the oceanic abysses.