

we know, derives all its absorbed oxygen and nitrogen from the atmosphere,—neither gas can come in from any other source, apart *perhaps* from a small quantity of nitrogen produced in the putrefaction of the bodies of marine animals and plants, which may, however, be safely neglected. Hence, we should say the ocean can nowhere contain more than 15.6 c.c. of nitrogen and 8.18 c.c. of oxygen gas per litre, and the quantity of nitrogen per litre will never fall below $\frac{760-33}{760} \times 8.94 = 8.55$ c.c. We cannot make a similar assertion in regard to the oxygen, and for it put down the minimum at $\frac{727}{760} \times 4.50 = 4.30$ c.c., because it is liable to constant diminution by the processes of life and putrefaction and processes of oxidation generally.”

The apparatus and methods used for extracting the gases were Jacobsen's modification of those of Bunsen. It may be stated here that the water was run very carefully into the bottom of the flask through a tube with narrow orifice, so as to produce the least possible commotion in the water, and consequent contact of it with the air. The flask was thus filled quite full, and allowed to overflow to a certain extent, so as to eliminate the water which had entered the flask first. The gas collecting apparatus was then immediately inserted. It would, no doubt, be satisfactory to have a water-bottle which would be available for use on the sounding line and in the laboratory, so that the sample could be boiled out without the water having been brought into contact with the air at all, and indeed Mr. Buchanan's stopcock water-bottle was originally designed with a view of meeting this requirement, but without success. Stopcocks which are quite tight at a uniform temperature cannot be depended on to remain so when the temperature is varied.

That the method of decantation adopted worked quite satisfactorily is shown by the analyses of the air-samples so obtained, and notably in the following case. A sample of water obtained from 2875 fathoms in lat. 30° 22' N., long. 154° 56' W., the depth of the sea being 2950 fathoms, was decanted as described and boiled. The gas collected from it and freed from carbonic acid contained only 3.84 per cent. of oxygen. The same water if shaken up with air would have furnished a gas containing about 34 per cent. of oxygen. It is evident then that, if a water so far removed from saturation can be decanted, and after the short unavoidable exposure to the air is found to furnish a gas with less than 4 per cent. of oxygen, any error arising from this cause, when the operation is carried out with the requisite skill and expedition, is negligible. When the gas collecting apparatus had been attached the bulb containing distilled water was boiled briskly, keeping up a *continuous* stream of steam for twelve minutes, when the open end of the gas tube was closed and sealed. Connection was then re-established between the flask and the gas tube, and heat was applied to the water-bath in which the flask was immersed. The water in the water-bath was thus gradually heated to