

glass. Currents like these must arise in all water-basins, and even in the oceans if different parts of their surface are unequally heated.”¹

This is of course a common class-experiment illustrating convection. It is evidently impossible that movements of ocean water can be produced in this way, for it is well known that everywhere, except under certain exceptional circumstances in the polar basin, the temperature of the sea decreases from the surface to a minimum at the bottom, and tropical heat is applied at the surface only. It is singular that this irrelevant illustration should have been introduced by Professor Buff; for his account of the origin and extension of the Gulf-stream, which may be taken as the type and exponent of ocean currents, is quite consistent with the commonly received opinions.

On working up the temperature results of the ‘Porcupine’ expedition of 1869, Dr. Carpenter satisfied himself that the mass of comparatively warm water, 800 fathoms deep, which we had established as existing, and probably moving in a north-easterly direction, along the west coasts of Britain and the Lusitanian peninsula, could not be an extension of the Gulf-stream, but must be due to a general circulation of the waters of the ocean comparable with the circulation of the atmosphere.

“The influence of the Gulf-stream proper (meaning

¹ Familiar Letters on the Physics of the Earth; treating of the chief Movements of the Land, the Water, and the Air, and the Forces that give rise to them. By Henry Buff, Professor of Physics in the University of Giessen. Edited by A. W. Hofmann, Ph.D., F.R.S. London: 1851.