

penter in a lecture to the Royal Geographical Society, in an illustration drawn from two supposed basins, one under equatorial conditions and the other under polar, connected by a strait,<sup>1</sup> says: "The effect of surface-*heat* upon the water of the tropical basin will be for the most part limited to its uppermost stratum, and may here be practically disregarded. But the effect of surface-cold upon the water of the polar basin will be to reduce the temperature of its whole mass below the freezing-point of fresh water, the surface stratum sinking as it is cooled, by virtue of its diminished bulk and increased density, and being replaced by water not yet cooled to the same degree. The warmer water will not come up from below, but will be drawn into the basin from the surface of the surrounding area; and since what is thus drawn away must be supplied from a yet greater distance, the continual cooling of the surface stratum in the polar basin will cause a 'set' of water towards it to be propagated backwards through the whole intervening ocean in connection with it, until it reaches the tropical area." And further on in the same address: "It is seen that the application of *cold at the surface* is precisely equivalent as a moving power to that application of *heat at the bottom* by which the circulation of water is sustained in every heating apparatus that makes use of it." No doubt the application of cold to the surface of a mass of water previously at the same temperature throughout, would

<sup>1</sup> On the Gibraltar Current, the Gulf-stream, and the general Oceanic Circulation. By Dr. W. B. Carpenter, F.R.S. Reprinted from the Proceedings of the Royal Geographical Society of London, 1870.