

between them, together with the lines themselves, representing a crust of two hundred miles in depth. In either case, we must be prepared to maintain, that a temperature many times greater than that sufficient to melt the most refractory substances known to us, is sustained at the centre of the globe; while a comparatively thin crust, resting upon the fluid, remains unmelted; or is even, according to M. Cordier, increasing in thickness, by the continual addition of new internal layers solidified during the process of refrigeration.

The mathematical calculations of Fourier, on the passage of heat through conducting bodies, have been since appealed to in support of these views; for he has shown that it is compatible with theory that the present temperature of the surface might co-exist with an intense heat, at a certain depth below. But his reasoning seems to be confined to the conduction of heat through solid bodies; and the conditions of the problem are wholly altered when we reason about a fluid nucleus, as we must do, if it be assumed that the heat augments from the surface to the interior, according to the rate observed in mines. For when the heat of the lower portion of a fluid is increased, a circulation begins throughout the mass, by the ascent of hotter, and the descent of colder currents. And this circulation, which is quite distinct from the mode in which heat is propagated through solid bodies, must evidently occur in the supposed central ocean, if the laws of fluids and of heat are the same there as upon the surface.

In Mr. Daniell's experiments for obtaining a measure of the heat of bodies, at their point of fusion, he invariably found that it was impossible to raise the heat of a large crucible of melted iron, gold, or silver, a single degree beyond the melting point, so long as a bar of the respective metals was kept immersed in the fluid portions. So in regard to other substances, however great the quantities fused, their temperature could not be raised while any solid pieces immersed in them remained unmelted; every accession of heat being instantly absorbed during their liquefaction. These results are, in fact, no more than the extension of a principle previously established, that so long as a fragment of ice remains in water, we cannot raise the temperature of the water above 32° F.

If, then, the heat of the earth's centre amount to $450,000^{\circ}$ F., as M. Cordier deems highly probable, that is to say, about twenty times the heat of melted iron, even according to Wedgwood's scale, and upwards of 160 times according to the improved pyrometer, it is clear that the upper parts of the fluid mass could not long have a temperature only just sufficient to melt rocks. There must be a continual tendency towards a uniform heat; and until this were accomplished, by the interchange of portions of fluid of different densities, the surface could not begin to consolidate. Nor, on the hypothesis of primitive fluidity, can we conceive any crust to have been formed until *the whole* planet had cooled down to about the temperature of incipient fusion.

It cannot be objected that hydrostatic pressure would prevent a tendency to equalization of temperature; for, as far as observations