XLVII. *Experiments and Obſervations on the Compreſſibility of Water and ſome other Fluids, by* John Canton, *M. A. and F. R. S.*

Read Nov. 8, 1764.

IN a paper lately laid before the Royal Society *, I not only related the experiments by which I found water to be compreſſible, but alſo thoſe by which I diſcovered how much a given weight would compreſs it when in a temperate degree of heat. By ſimilar experiments made ſince, it appears that water has the remarkable property of being more compreſſible in winter than in ſummer; which is contrary to what I have obſerved both in ſpirit of wine and oil of olives: theſe fluids are (as one would expect water to be) more compreſſible when expanded by heat, and leſs ſo when contracted by cold. Water and ſpirit of wine I have ſeveral times examined, both by the air-pump and condenſer, in oppoſite ſeaſons of the year: and, when Fahrenheit's thermometer has been at 34 degrees, I have found the water to be compreſſed by the mean weight of the atmoſphere 49 parts in a million of its whole bulk, and the ſpirit of wine 60 parts; but when the thermometer has been at 64 degrees, the ſame weight would compreſs the water no more than 44 parts in a million, and the ſpirit of wine no leſs than 71 of the ſame parts. In making theſe experiments, the glaſs ball containing the fluid to be compreſſed muſt be kept under water, that the heat of it may not be altered during the operation.

The compreſſion by the weight of the atmoſphere, and the ſpecific gravity of each of the following fluids, (which are all that I have yet tried,) were found when the barometer was at 29 $\frac{1}{2}$ inches, and the thermometer at 50 degrees.

* See Philoſophical Tranſactions, Vol. LII. p. 640.

Com-

	Millionth parts.		Specific gravity.
Compreſſion of ſpirit of wine	66	—	846
Oil of olives	48	—	918
Rain-water -	46	—	1000
Sea-water - -	40	—	1028
Mercury - -	3	—	13595

Theſe fluids are not only compreſſible, but alſo elaſtic: for if the weight by which they are naturally compreſſed be diminiſhed, they expand; and if that by which they are compreſſed in the condenſer be removed, they take up the ſame room as at firſt. That this does not ariſe from the elaſticity of any air the fluids contain, is evident; becauſe their expanſion, by removing the weight of the atmoſphere, is not greater than their compreſſion by an equal additional weight: whereas air will expand twice as much by removing half the weight of the atmoſphere, as it will be compreſſed by adding the whole weight of the atmoſphere.

It may alſo be worth obſerving, that the compreſſions of theſe fluids, by the ſame weight, are not in the inverſe ratio of their denſities or ſpecific gravities, as might be ſuppoſed. The compreſſion of ſpirit of wine, for inſtance, being compared with that of rain-water, is *greater* than in this proportion, and the compreſſion of ſea-water is *leſs*.

The weight of $32\frac{1}{2}$ feet of ſea-water is equal to the mean weight of the atmoſphere: and, as far as trial has yet been made, every additional weight equal to that of the atmoſphere, compreſſes a quantity of ſea-water 40 millionth parts; now if this conſtantly holds, the ſea, where it is two miles deep, is compreſſed by its own weight 69 feet 2 inches; and the water at the bottom is compreſſed 13 parts in 1000.

XLVIII. *Conciſe*