|  |  |  |
| --- | --- | --- |
| Temperature of Water. | Bulk of Water. | Specific  Gravity. |
| 30 |  |  |
| 35 | 99910 | 2,00090 |
| 40 | 99070 | 1,00094 |
| 45 | 99914 | 1,00086 |
| 50 | 99932 | 1,00068 |
| 55 | 99962 | 1,00038 |
| 60 | 100000 | 1,00000 |
| 65 | 100050 | 0,99950 |
| 70 | 100106 | 0,99894 |
| 75 | 100171 | 0,99830 |
| 80 | 100242 | 0,99759 |
| 85 | 100320 | 0,99681 |
| 90 | 100404 | 0,99598 |
| 95 | 100501 | 0,99502 |
| 100 | 1006θ2 | 0,99402 |

Thoſe gentlemen obſerved the expanſion of water to be very anomalous between 32⁰ and 45⁰. This is diſtinct­ly ſeen during the gradual cooling of water to the point of freezing. It contracts for a while, and then ſuddenly expands. But we ſeldom have occaſion to mea­ſure ſpecific gravities in ſuch temperature.

The reader is now sufficiently acquainted with the principles of this hydrostatical method of determining the ſpecific gravity of bodies, and can judge of the propriety of the forms which may be propoſed for the experiment.

The ſpecific gravity of a fluid may be determined either by filling with it a veſſel with a narrow neck, or by weighing a ſolid body that is immerſed in it. It is hard to ſay which is the beſt way. The laſt is not ſub­ject to any error in filling, becauſe we may ſuſpend the ſolid by a fine wire, which will not diſplace any ſenſible quantity of the fluid ; and if the ſolid is but a little heavier than the fluid, the balance being loaded only with the exceſs, will be very ſenſible to the ſmalleſt want of equilibrium. But this advantage is perhaps compen­ſated by an obstruction to the motion of the ſolid up or down in the fluid, ariſing from viscidity. When the weight in the oppoſite ſcale is yet too ſmall, we ſlowly add more, and at laſt grain by grain, which gradually brings the beam to the level. When it is exactly level, the weight in the ſcale is ſomewhat too great; for it not only balances the preponderance of the ſolid, but alſo this viſcidity of the fluid. But we may get rid of this error. Add a ſmall quantity more ; this will bring the beam over to the other side. Now put as much into the ſcale on the ſame side with the ſolid ; this will not reſtore the beam to its level. We muſt add more till this be accompliſhed ; and this addition is the mea­ſure of the viſeidity of the fluid, and muſt be ſubtracted from the weight that was in the other ſcale when the beam came first to a level. This effect of viſcidity is not inſenſible, with nice apparatus, even in the pureſt water, and in many fluids it is very conſiderable—and, what is worſe, it is very changeable. It is greatly diminiſhed by heat ; and this is an additional reaſon for making thoſe trials in pretty warm temperatures. But for fluids of which the viſcidity is conſiderable, this **method is by no means proper ; and we** muſt **take the**

other, and weigh them in a veſſel with a narrow neck. Mercury muſt alſo be treated in this way, becauſe we have no ſolid that will sink in it but gold and platina.

It is not ſo eaſy as one would imagine to fill a veſſel preciſely to the ſame degree upon every trial. But if we do not operate on too ſmall quantities, the unavoid­able error may be made altogether inſignificant, by having the neck of the veſſel very ſmall. If the veſſel hold a pound of water, and the neck do not exceed a quarter of an inch (and it will not greatly retard the operation to have it half this ſize), the examinator muſt be very careleſs indeed to err one part in two thouſand ; and this is perhaps as near as we can come with a ba­lance. We muſt always recollect that the capacity of the veſſel changes by heat, and we muſt know this va­riation, and take it into the account. But it is affecta­tion to regard (as Mr Homberg would make us believe that he did) the diſtenſion of the veſſel by the preſſure of the fluid. His experiments of this kind have by no means the conſiſtency with each other that ſhould con­vince us that he did not commit much greater errors than what aroſe from diſtenſion.

In examining either ſolids or fluids, we muſt be careful to free their ſurface, or that of the veſſel in which the fluid is to be weighed, from air, which frequently adheres to it in a peculiar manner, and, by forming a bubble, increaſes the apparent bulk of the ſolid, or diminiſhes the capacity of the veſſel. The greateſt part of what appears on thoſe occaſions ſeems to have exiſted in the fluid in a ſtate of chemical union, and to be ſet at liberty by the ſuperior attraction of the fluid for the contiguous ſolid body. Theſe air bubbles muſt be carefully bruſhed off by hand. All greasy matters muſt be cleared off for the ſame reaſon : they prevent the fluid from coming into contact.

We muſt be no leſs careful that no water is imbibed by the ſolid, which would increaſe its weight without increaſing its bulk. In ſome caſes, however, a very long maceration and imbibition is neceſſary. Thus, in examining the ſpecific gravity of the fibrous part of vegetables, we ſhould err exceedingly if we imagined it as ſmall as appears at firſt. We believe that in moſt plants it is at leaſt as great as water, for after long maceration they sink in it.

It is almoſt needleſs to ſay that the niceſt and moſt ſenſible balances are neceſſary for this examination. Ba­lances are even conſtructed on purpoſe, and fitted with ſeveral pieces of apparatus, which make the examination eaſy and neat. We have deſcribed (ſee Balance) Mr Graveſande’s as one of the moſt convenient of any. His contrivance for obſerving the fractions of a grain is extremely ingenious and expeditious, eſpecially for de­tecting the effect of viſcidity.

The hydrometer, or aecometer, is another inſtrument for aſcertaining the ſpecific gravity of fluids. This very pretty inſtrument is the invention of a lady, as eminent for intellectual accompliſhments as ſhe was admired for her beauty. Hypatia, the learned daughter of the cele­brated mathematician Theon of Alexandria, became for eminent for her mathematical knowledge, that ſhe was made public profeſſor of the ſcience in the firſt ſchool in the world. She wrote a commentary on the works of Apollonius and of Diophantus, and compoſed Aſtronomical Tables ; all of which are loſt. Theſe rare