**not regulate or** prevent ; but we know very few indeed that can make any ſenſible change in this weight with­out the addition or abſtraction of other matter. Even taking it to the ſummit of a high mountain, or from the equator to the polar region, will make no change in its weight as it is aſcertained by the balance, becauſe there is the ſame real diminution of weight in the pounds and ounces uſed in the examination.

Notwithſtanding the unavoidable change which heat and cold make in the bulk of bodies, and the permanent varieties of the ſame kind of matter which are cauſed by different circumſtances of growth, texture, &c. moſt kinds of matter have a certain conſtancy in the denſity of their particles, and therefore in the weight of a given bulk. Thus the purity of gold, and its degree of adul­teration, may be interred ſrom its weight, it being purer in proportion as it is more denſe. The denſity, there­fore, of different kinds of tangible matter becomes cha­racteriſtic of the kind, and a teſt oſ its purity ; it marks **a** particular appearance in which matter exiſts, and may therefore be called, with propriety, Specific.

But this denſity cannot be directly obſerved. It is not by comparing the diſtances between the atoms of matter in gold and in water that we say the firſt is 19 times denser than the laſt, and that an inch of gold con­tains 19 times as many material atoms as an inch of water ; we reckon on the equal gravitation of every atom of matter whether of gold or of water ; therefore the weight of any body becomes the indication oſ its material denſity, and the weight of a given bulk be­comes ſpecific of that kind of matter, marking its kind, and even aſcertaining its purity in this form.

It is evident that, in order to make this compariſon of general uſe, the ſtandard muſt be familiarly known, and muſt be very uniform in its denſity, and the com­pariſon of bulk and denſity muſt be eaſy and accurate. The moſt obvious method would be to form, with all nicety, a piece of the ſtandard matter of ſome conveni­ent bulk, and to weigh it very exactly, and keep a note of its weight: then, to make the compariſon of any other ſubſtance, it muſt be made into a maſs of the ſame preciſe bulk, and weighed with equal care ; and the moſt convenient way of expreſſing the ſpecific gravity would be to conſider the weight of the ſtandard as unity, and then the number expreſſing the ſpecific gravity is the number of times that the weight of the ſtandard is con­tained in that of the other ſubſtance. This compariſon is moſt easily and accurately made in fluids. We have only to make a veſſel of known dimenſions equal to that of the ſtandard which we employ, and to weigh it when empty, and then when filled with the fluid. Nay, the moſt difficult part of the proceſs, the making a veſſel of the preciſe dimenſions of the ſtandard, may be avoided, by uſing ſome fluid ſubſtance for a ſtandard. Any veſſel will then do ; and we may enſure very great accuracy by uſing a veſſel with a ſlender neck, ſuch as **a** phial or matrass ; for when this is filled to a certain mark in the neck, any error in the eſtimation by the eye will bear a very ſmall proportion to the whole. The weight of the ſtandard fluid which fills it to this mark being carefully aſcertained, is kept in remembrance. The ſpecific gravity of any other fluid is had by weighing the contents of this veſſel when filled with it, and divi­ding the weight by the weight of the ſtandard. The quotent is the ſpecific gravity of the fluid. But in all other

caſes this is a very difficult problem: it requires **very nice** hands, and an accurate eye, to make two bodies of the ſame bulk. An error of one hundredth part in the linear dimenſions of a ſolid body makes **an** error of **a** 30th part in its bulk ;and bodies of irregular ſhapes and friable ſubſtance, ſuch as the ores of metals, cannot be brought into convenient and exact dimenſions for meaſurement.

From all theſe inconveniences and difficulties we are freed by the celebrated Archimedes, who, from the prin­ciples of hydroſtatics diſcovered or eſtabliſhed by him, deduced the accurate and eaſy method which is now univerſally practiſed for discovering the ſpecific gravi­ty and denſity of bodies. (See Archimedes and Hy­drostatics, n⁰ 11.) Inſtead of meaſuring the bulk off the body by that of the displaced fluid (which would have been impoſſible for Archimedes to do with any thing like the neceſſary preciſion), we have only to obſerve the loſs of weight iuſtained by the ſolid. This can be done with great eaſe and exactneſs. Whatever may be the bulk of the body, this loſs of weight is the weight of an equal bulk of the fluid ; and we obtain the ſpecific gravity of the body by ſimply dividing its whole weight by the weight loſt : the quotient is the ſpecific gravity when this fluid is taken for the ſtandard, even though we ſhould not know the abſolute weight of any given bulk of this ſtandard. It alſo gives us an eaſy and accurate method of aſcertaining even this fundamen­tal point. We have only to form any ſolid body into an exact cube, ſphere, or priſm, of known dimenſions, and obſerve what weight it loses when immerſed in this ſtandard fluid. This is the weight of the ſame bulk of the ſtandard to be kept in remembrance ; and thus we obtain, by the by, a moſt eaſy and accurate method for meaſuring the bulk or ſolid contents of any body, however irregular its ſhape may be. We have only to ſee how much weight it loses in the ſtandard fluid ; we can compute what quantity of the ſtandard fluid will have this weight. Thus ſhould we find that a quantity of sand, or a furze buſh, loses 250 ounces when immer­ſed in pure water, we learn by this that the ſolid mea­ſure of every grain of the fand, or of every twig and prickle of the furze, when added into one ſum, amounts to the fourth part of a cubic foot, or to 432 cubic in­ches.

To all theſe advantages of the Archimedean method of aſcertaining the ſpecific gravity of bodies, derived from his hydroſtatical doctrines and diſcoveries, we may add, that the immediate ſtandard of compariſon, namely, water, is, of all the ſubſtances that we know, the fitteſt for the purpoſe of an univerſal ſtandard of reference. In its ordinary natural ſtate it is ſufficiently conſtant and uniform in its weight for every examination where the utmoſt mathematical accuracy is not wanted ; all its variations ariſe from impurities, from which it may at all times be ſeparated by the ſimple proceſs of diſtillation : and we have every reaſon to think that when pure, its denſity, when of the ſame temperature, is in­variable.

Water is therefore univerſally taken for the unit of that ſcale on which we meaſure the ſpecific gravity of bodies, and its weight is called 1. The ſpecific gravity of any other body is the real weight in pounds and ounces, when of the bulk of one pound or one ounce of water. It is therefore of the firſt importance, in all