ther b, the bulk of the added ingredient, ſuffers any change. We ſhall have occaſion by and by to reſume the consideration of this queſtion, which is of the firſt moment in the theory of ſpecific gravities, and has great influence in many tranſactions of commerce.

This ſeries of ſpecific gravities is not ſo well fitted for commercial tranſactions. In theſe the uſual queſ­tion is, how many gallons oſ alcohol is there in a caſk, or ſome number of gallons of ſpirit ? and it is more directly anſwered by means of a table, formed by mix­ing the ingredients in aliquant parts of one conſtant bulk. The following table, conſtructed from the ex­periments of Mr Briſſon of the academy of Paris, and publiſhed in the Memoirs for 1769, is therefore inſerted.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| W. | **A.** | Density  obſerved. | Density  computed. | Condensation | Bulk of  **10,000**  grains. |
| 0 | 16 | 0,8371 | O,837i |  | 1,0000 |
| 1 | 15 | 0,8527 | 0,8473 | 63 | 0,9937  O,9885 |
| **2** | 14 | 0,8674 | 0,8575 | 115 |
| **3** | 13 | 0,8815 | 0,8677 | 157 | 0,9844 |
| 4 | I 2 | 0,8947 | 0,8778 | 189 | 0,98 **I I** |
| 5 | I I | 0,9075 | 0,8880 | 214 | 0,9786 |
| 6 | 10 | 0,9199 | 0,8982 | 235 | 0,9765 |
| 7 | 9 | 0,9317 | 0,9084 | 251 | o,9749 |
| 8 | 8 | 0,9427 | 0,9186 | 256 | 0,9744 |
| 9 | 7 | 0,9519 | 0,9287 | 243 | 0,9757 |
| 10 | 6 | 0,9598 | 0,9389 | 217 | 0,9783 |
| **I I** | 5 | 0,9674 | 0,9491 | 189 | 0,98 **I I** |
| **12** | 4 | 0,9733 | 0,9593 | 144 | 0,9856 |
| 13 | 3 | 0,9791 | 0,9695 | 99 | 0,9901 |
| **14** | 2 | 0,9852 | 0,9796 | 57 | 0,9943 |
| 15 | I | 0,9919 | 0,9898 | 21 | 0,9979 |
| 16 | 0 | 1,0000 | 1,0000 |  | 1,0000 |

In this table the whole quantity of ſpirituous liquor is always the ſame. The firſt column is the number of meaſures (gallons, pints, inches, &c.) of water in the mixture ; and column 2d gives the meaſures of alcohol. Column 3d is the ſpecific gravity which was obſerved by Mr Briſſon. Column 4th is the ſpecific gravity which would have been obſerved if the ſpirits, or wa­ter, or both, had retained their ſpecific density un­changed. And the 5th column marks the augmenta­tion of ſpecific gravity or density in parts of 10,000. A 6th column is added, ſhowiag the bulk of the 16 cubic meaſures of the two ingredients. Each meaſure may be conceived as the 16th part of 10,000, or 625 ; and we may ſuppoſe them cubic inches, pints, gallons, or any solid meaſure.

This table ſcarcely differs from Sir Charles Blagden’s ; and the very ſmall difference that may be ob­ſerved, ariſes from Mr Briſſon’s having uſed an alcohol not ſo completely rectified. Its ſpecific gravity is 0,8371, whereas the other was only 0,8250.

Here it appears more diſtinctly that the condenſation is greateſt when the two ingredients are of equal bulk.

Perhaps this ſeries of ſpecific gravities is as declara­tive as the other, whether or not there is a change of density induced on either of the ingredients. The whole bulk being always the ſame, it is plain that the

ſucceſſive equal additions to one of the ingredients is a ſucceſſive equal abſtraction of the other. The change produced, therefore, in the weight of the whole, is the difference between the weight of the ingredient which is taken out and the weight of the equal meaſure of the other which ſupplies its place. Therefore, if nei­ther ingredient changes its density by mixture, the weights of the mixtures will be in arithmetical progreſſion. If they are not, there is a variation of density in one or both the ingredients.

We ſee this very clearly in the mixtures of water and alcohol. The firſt ſpecific gravity differs from the ſe­cond by 156, and the laſt differs from the preceding by no more than 81. Had neither of the densities chan­ged, the common difference would have been 102. We obſerve alſo, that the augmentation of ſpecific gra­vity, by the ſucceſſive addition of a meaſure of water, grows leſs and leſs till 12 meaſures of water is mixed with 4 of alcohol, when the augmentation is only 58, and then it increaſes again to 81.

It alſo appears, that the addition of one meaſure of water to a quantity of alcohol produces a greater change of density than the mixture of one meaſure of alcohol to a quantity of water. Hence ſome conclude, that the water diſappears by being lodged in the interſtices of the ſpirit. But it is more agreeable to the juſtest no­tions which we can form of the internal conſtitution of tangible bodies to ſuppoſe that the particles of water diminiſh the diſtances between the particles of alcohol by their ſtrong attractions, and that this diminution (exceedingly minute in itſelf ) becomes ſenſible on ac­count oſ the great number or particles whoſe diſtances are thus diminiſhed. This is merely a probability founded on this, that it would require a much greater diminution of diſtances if it was the particles of water which had their diſtances thus diminiſhed. But the greater probability is, that the condenſation takes place in both.

We have been ſo particular in our conſideration of this mixture, becauſe the law of variation of density has, in this inſtance, been aſcertained with ſuch precision by the elaborate examination of Sir Charles Blagden, ſo that it may ſerve as an example of what happens in al­moſt every mixture of bodies. It merits a still farther diſcuſſion, becauſe it is intimately connected with the action of the corpuſcular forces; and an exact knowledge of the variations of diſtance between the particles will go far to aſcertain the law of action of theſe forces. But the limits of a Work like this will not permit us to dwell longer on this ſubject. We proceed therefore to give another uſeful table.

The vitriolic or ſulphuric acid is of extensive uſe in manufactures under the name of oil of vitriol. Its va­lue depends entirely on the ſaline ingredient, and the water is merely a vehicle for the acid. This, being much denſer than water, affects its ſpecific gravity, and thus gives us a method of aſcertaining its ſtrength.

The ſtrongeſt oil of vitriol that can be eaſily manu­factured contains 612 1/20 grains of dry acid, united with 387 1/20 grains of water, which cannot be ſeparated from it by diſtillation, making 1000 grains of oil of vitriol. Its ſpecific gravity in this ſtate is 1,877.

The following table ſhows its ſpecific gravity at the temperature 55⁰, when diluted by the ſucceſſive addi­tion of parts of water by weight.