neceſſary for bringing all things again into equilibrium. We refer the curious reader to the ingenious theory of the Abbé Boſcovſeh for an excellent illuſtration of this ſubject ( *Theor. Phil. Nat.* de Solutione Chemica).

This queſtion is no leſs important to the man of bu­ſineſs. Till we know the condenſation of thoſe metals by mixture, we cannot tell the quantity of alloy in gold and ſilver by means of their ſpecific gravity ; nor can we tell the quantity of pure alcohol in any ſpirituous li­quor, or that of the valuable ſalt in any ſolution of it. For want of this knowledge, the dealers in gold and ſilver are obliged to have recourſe to the tedious and difficult teſt of the aſſay, which cannot be made in all places or by all men. It is therefore much to be wiſhed, that ſome persons would inſtitute a ſeries of ex­periments in the moſt intereſting caſes : for it muſt be obſerved, that this change of denſity is not always a ſmall matter ; it is ſometimes very conſiderable and pa­radoxical. A remarkable inſtance may be given of it in the mixture of braſs and tin for bells, great guns, optical speculums, &c. The ſpecific gravity of caſt braſs is nearly 8,oc6, and that of tin is nearly 7,363. If two parts of braſs be mixed with one of tin, the ſpecific gra­vity is 8,917 ; whereas, if each had retained its former bulk, the ſpecific gravity would have been only 7,7.93

2×8,006+7,363

*= 3 A* mixture of equal parts

ſhould have the ſpecific gravity 7,684 ; but it is 8,441. A mixture of two parts tin with one part braſs, inſtead of being 7,577, is 8,027.

In all theſe caſes there is a great increaſe of ſpecific gravity, and conſequently a great condenſation of parts or contraction of bulk. The firſt mixture of eight cu­bic inches of braſs, for inſtance, with four cubic inches of tin, does not produce 12 cubic inches of bell-metal, but only 101/2 nearly, having ſhrunk 1/5. It would ap­pear that the diſtances of the braſs particles are moſt af­fected, or perhaps it is the braſs that receives the tin into its pores ; for we find that the condenſations in theſe mixtures are nearly proportional to the quantities of the braſs in the mixtures. It is remarkable that this mixture with the lighteſt of all metals has made a com­poſition more heavy and denſe than braſs can be made by any hammering.

The moſt remarkable inſtance occurs in mixing iron with platina. If 10 cubic inches of iron are mixed with of platina, the bulk of the compound is only 93/4 inches. The iron therefore has not ſimply received the platina into its pores : its own particles are brought nearer together. There are ſimilar reſults in the ſolu­tion of turbith mineral, and of ſome other ſalts, in wa­ter. The water, inſtead of riſing in the neck of the veſſel, when a ſmall quantity of the ſalt has been added to it, ſinks conſiderably, and the two ingredients occupy leſs room than the water did alone.

The ſame thing happens in the mixture of water with other fluids and different fluids with each other : But we are not able to trace any general rule that is ob­ſerved with abſolute preciſion. In moſt caſes of fluids the greateſt condenſation happens when the bulks of the ingredients are nearly equal. Thus, in the mix­ture of alcohol and water, we have the greateſt conden­sation when 161/2 ounces of alcohol are mixed with 20 ounces of water, and the condenſation is about 1/30 of the whole bulk of the ingredients. It is extremely va­

rious in different ſubſtances, and no claſſification of **them** can be made in this reſpect,

A diſsertation has been publiſhed on this ſubject by Dr Hahn of Vienna, intitled *De Efficacia Mixtionis in mutandis Corporum Voluminibus,* in which all the remark­able inſtances of the variation of denſity have been col­lected. All that we can do (as we have no directing principle) is to record ſuch inſtances as are of chief im­portance, being articles of commerce.

The firſt that occurs to us is the mixtures oſ alcohol and water in the compoſition of ſpirituous liquors. This has been conſidered by many with great care. The moſt ſcrupulous examination of this, or perhaps of any mix­ture, has been lately made by Dr Blagden (now Sir Charles Blagden) of the Royal Society, on the requiſition of the Board of Exciſe. He has publiſhed an ac­count of the examination in the Philoſophical Tranſac­tions of London in 1791 and 1792. We ſhall give an account of it under the article *Spirituous Liquors ;* and at preſent only ſelect one column, in order to ſhow the condenſation. The alcohol was almoſt the ſtrongeſt that can be produced, and its ſpecific gravity, when of the temperature 60⁰, was 0,825. The whole mix­tures were of the ſame temperature.

Column I. contains the pounds, ounces, or other meaſures by weight, of alcohol in the mixture. Co­lumn 2. contains the pounds or ounces of water. Co­lumn 3. is the ſum of the bulks of the ingredients, the bulk of a pound or ounce of water being accounted 1. Column 4. is the obſerved ſpecific gravity of the mix­ture, taken from Dr Blagden's diſſertation. Column 5. is the ſpecific gravity which would have been obſerved if the ingredients had each retained its own ſpecific gra­vity. This we calculated by dividing the ſum oſ the two numbers of the firſt and ſecond columns by the correſponding number of the third. Column 6. is the dif­ference of column 4. and column 5. and exhibits the condenſation.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A. | W. | Volume. | Sp. Grav obſerved. | Sp. Graval culated. | Conden­  ſation. |
| 20 | 0 | 24,2424 | 0,8250 | 0,8250 | 00 |
| 20 | 1 | 25,2424 | 0,8360 | 0,8320 | 40 |
| 20 | 2 | 26,2424 | 0,8457 | 0,8383 | 74 |
| 20 | 3 | 27,2424 | 0,8543 | 0,8443 | 100 |
| 20 | 4 | 28,2424 | 0,8621 | 0,8498 | 123 |
| 20 | 5 | 29,2424 | 0,8692 | 0,8549 | 143 |
| 20 | 6 | 30,2424 | 0,8757 | 0,8597 | 160 |
| 20 | 7 | 31,2424 | 0,8,817 | c,8642 | 175 |
| 20 | 8 | 32,2424 | 0,8872 | 0,8684 | 188 |
| 20 | 9 | 33,2424 | 0,8923 | 0,8724 | 199 |
| 20 | 10 | 34,2424 | 0,8971 | 0,8761 | 216 |
| 20 | I I | 35,2424 | 0,9014 | 0,8796 | 218 |
| 20 | I 2 | 36,2424 | 0,9055 | 0,8829 | 226 |
| 20 | 13 | 37,2424 | 0,9093 | 0,8860 | 233 |
| 20 | 14 | 38,2424 | 0,9129 | 0,8891 | 238 |
| 20 | 15 | 39,2424 | 0,9162 | 0,8919 | 243 |
| 20 | 16 | 40,2424 | 0,9193 | 0,8946 | 247 |
| 20 | 17 | 41,2424 | 0,9223 | 0,8971 | 252 |
| 20 | 18 | 42,2424 | 0,9250 | c,8996 | 254 |
| 20 | 19 | 43,2424 | 0,9276 | 0,9019 | 257 |
| 20 | 20 | 44,2424 | 0,9300 | 0,9041 | 259 |
| 19 | 20 | 43,0303 | 0,9325 | 0,9063 | 262 |