gravity, mentioning ſuch circumſtances of the results as ſuited our purpoſes of phyſical diſcuſſion. At preſent we give the general reluit in the table oſ ſpecific gravity, as peculiarly belonging to ſpirituous liquors, affording the moſt exact: account of their denſity in every ſtate of dilution of alcohol with water. And as the relation between the proportion of ingredients and the denſity is peculiar to every ſubstance, ſo that ſcarcely any inference can be made from one to another, the reader will consider the tables here given as characteristic with reſpect to alcohol. In all ſolutions of salts we found that the condenſation increases continually with the dilution, whereas it is greatest when equal bulks of water and alcohol are mixed : yet we do not conſider this as an exception ; for it is certain, that in the ſtrongest brine the ſaline ingredient bears but a ſmall pro­portion to the water—and when we mix two ſolutions, the condenſation is greateſt when they are nearly equal in bulk. But we think ourſelves entitled to infer, that alcohol is not a dilution of a ſubftance in a quantity of water; but that water, in a certain proportion, not very distant from what we can produce by flow diſtillation, is an ingredient of alcohol, or is one of its component parts, and not merely a vehicle or menſtruum. We therefore imagine that proof ſpirit contains nearly equal bulks of water and ardent ſpirits.

The great difficulty in this examination aroſe from the very diſſimilar expansions of water and alcohol by heat. This determined Sir Charles Blagden to estimate the proportions of ingredients by weight, and made it abſolutely neceſſary to give a ſcale of ſpecific gravity and strength for every temperature. For it must be remark­ed, that the question (whether in commerce or philoſophy) always is, “ How many gallons of alcohol and of water, taken just now and mixed together, will pro­duce a hundred gallons of the ſpirit we are exami­ning ?” The proportion of theſe two will be different according to the temperature of both. As many mix­tures therefore must have been made in each proportion as there were temperatures conſidered ; but by taking the ingredients by weight, and examining the denſity of the compound in one temperature, it is then heated and cooled, and its change of denſity obſerved. Calcu­lation then can tell us the change in the proportion of the bulks or numbers of gallons in the mixture, by means of a previous table ſhowing the expansions of water and of alcohol.

The alcohol ſelected for this examination had the speciſic gravity 0,825. This is not the purest that can be procured ; ſome was produced oſ 0,816, of 0,814, and 0,81 3, both obtained from rum, from brandy, and from malt ſpirit. We are informed that Dr Black has obtained it of the ſpecific gravity 0,8 by digeſting al­cohol with fixed ammoniac (muriatic acid united with lime) made very dry. It dephlegmates alcohol very powerfully without decompoſing it, which always hap­pens when we uſe cauſtic alkali. Alcohol of 0,825 was choſen becauſe expreſſed by a number of eaſy manage­ment in computation.

The examination commenced by aſcertaining the expanſions of water and alcohol. The temperature 60⁰ of Fahrenheit’s ſcale was ſelected for the general tem­perature of compariſon, being eaſily attainable even in cold weather, and allowing the examinator to operate at eaſe. The firſt and laſt copartments of the tables contain the weights and ſpecific gravities of alcohol and water for every fifth degree of heat from 30⁰ to 100⁰. From theſe we have conſtructed the two following little tables of expanſion. The bulk of 1000 ounces, pounds, or other weight of water and of alcohol of the tempera­ture 60⁰, occupies the bulks expreſſed in the tables for every other temperature. Water could not be eaſily or usefully examined when of the temperature 30⁰, becauſe it is with great difficulty kept fluid in that temperature. It is very remarkable, that when it can be ſo kept, it expands instead of contracting ; while cooling down from 35⁰ or thereabouts, and as it approaches to 32⁰, it expands rapidly. We obſerve the ſame thing in the cryſtallization of Glauber salt, martial vitriol, and ſome others, which contain much water in their crystals. We obſerve, on the other hand, a remarkable contraction in the zeolite just before its beginning to ſwell into bubbles by a red heat.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Heat | Bulk of 100,000 ounces. | | | |
| Of Water. | | Of Alcohol. | |
|  |  | Diff. |  | Diff. |
| 30⁰ |  |  | 119195 |  |
| 35 | 99910 |  | 119514 | 319 |
| 40 | 99906 | 4  + 8  18 | 119839 | 325  332  342  348 |
| 45 | 99914 | 120172 |
| 50 | 99932 | 30 | 120514 |
|  |  |  |
| 55  60 | 100000 | 38 | I2I2I2 | 35⁰ |
| 65  70 | 100050 | 50  56 | 121565 | 353  354 |
| 75 | 100170 | 64 | 121919  122279 | 360 |
| 80 | 100241 | 71 | 122645 | 366 |
| 85 | 100320 | 79  84 | 123017 | 372  376 |
|  |  |  |
| 90 | 100404 | 96 | 123393 | 380 |
| 95 | 100500 | 123773 |
| 100 | I 00608 | 108 | 124157 | 384 |

This being premiſed, the examination was conducted in the following manner. It was determined to mix 100 parts by weight of pure alcohol with five, ten, fif­teen, twenty, parts of distilled water, till they were compounded in equal quantities, and then to mix 100 parts of distilled water with 95, 90,85, 80, &c. parts of alcohol, till they were mixed in the proportion of 100 to 5. Thus a ſeries of mixtures would be obtained, ex­tending from pure alcohol to pure water. This ſeries would be ſuch, that the examinations would be moſt frequent in the cases moſt uſual in the commerce of ſtrong liquors. A ſet of phials, fitted with ground ſtoppers, were provided, of ſizes fit to hold the intended mixtures. Theſe mixtures were made by ſuſpending the phial to the arm of a very nice balance, in the op­poſite ſcale of which (besides the counterpoiſe of the phial) there was placed the weight 100. Spirit was then poured into the phial till it exactly balanced the weight 100. The weight for the water to be added was then put into the oppoſite ſcale, and water was poured into the phial by means of a ſlender glaſs funnel, by ſmall quantities at a time, and the phial frequently agitated to promote the mixture. When the additional weight was exactly balanced, the phial was taken off, its ſtopper put in, and leather tied over it, and it was ſet by, for at leaſt a month, that the mixture and the whole