taining the ſpecific gravity of diſſolved ſalts. In one of them (not particularly narrated) he found that a quantity of diſſolved ſalt occupied the same bulk in two very different ſtates of dilution. We cannot pretend to reconcile this with our experiments. We have gi­ven theſe as they flood ; and we think them concluſive, becauſe they were ſo numerous and ſo perfectly con­fident with each other ; and their reſult is ſo general, that we have not found an exception. Common ſalt is by no means the moſt remarkable inſtance of condenſa­tion. Vegetable alkali, ſal ammoniac, and ſome others, exhibit much greater condenſation.

We thought this a proper opportunity of conſidering this queſtion, which is intimately connected with the principles of chemical ſolution, and was not per­haps conſidered in sufficient detail under the article Che­mistry. We learn from it in general, that the quan­tities of ſalt in brines increaſe at ſomewhat a greater rate than their ſpecific gravities. This difference is in many cases of ſenſible importance in a commercial view. Thus an alkaline lixivium for the purpoſes of bleach­ing or ſoap-making, whoſe ſpecific gravity is 1,234, or exceeds that of water by 234, contains 361 ounces of ſalt in a cubic foot ; a ley, which exceeds the weight of water twice as much, or 468 ounces *per* cubic foot, contains 777 ounces of ſalt, which exceeds the double of 361 by 55 ounces more than 7 *per cent.* Hence we learn, that hydrometers for diſcovering the ſtrength **of** brines, having equal diviſions on a cylindrical ſtem, are very erroneous ; for even if the increments of ſpe­cific gravity were proportional to the quantities of ſalt in a gallon of brine, the diviſions at the bottom of the ſtem ought to be ſmaller than thoſe above.

The conſtruction of the following table oſ ſtrengths from the above narrated ſeries of brines is sufficiently obvious. Column 1st is the ſpecific gravity as diſcover­ed by the balance or hydometer, and alſo is the number of ounces in a cubic foot of the brine. Col. 2d is the ounces of the dry ſalt contained in it.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *TablE of Brines of Common Salt.* | | | | |
| Weight | Salt |  | Weight | Salt |
| Cub. Ft. | in |  | Cub. Ft. | in |
| Brine. | Cub. F. |  | Brine. | Cub. P |
| 1,000 | *0* |  | 1,115 | 170 |
| 1,008 | **10** |  | 1,122 | 180 |
| 1,015 | **20** |  | 1,128 | 190 |
| **1,022** | 30 |  | 1,134 | 200 |
| 1,029 | 40 |  | 1,140 | 210 |
| 1,036 | 50 |  | 1147 | 220 |
| 1,043 | 60 |  | 1,153 | 230 |
| **1,**050 | 70 |  | 1,159 | 240 |
| 1,057 | 80 |  | 1,165 | 250 |
| 1,064 | 90 |  | 1,172 | 260 |
| L∙070 | 100 |  | 1,178 | 270 |
| 1,077 | 110 |  | 1,184 | 280 |
| 1,083 | 120 |  | 1,190 | 290 |
| 1,090 | 130 |  | 1,197 | 300 |
| 1,096 | 140 |  | 1,203 | 310 |
| 1,103 | 150 |  | 1,206 | 316 |
| 1,109 | 160 | | 1,208 | 320 |

The table differs conſiderably from Mr Lambert’s. The quantities of ſalt correſponding to any ſpecific gravity are about 1/18th leſs than in his table But **the reader will see that they correſpond with the ſeries of**

experiments above narrated; and theſe **were but a** few of many which all correſponded within an hundredth part. The cauſe iof the difference ſeems to be, that moſt kinds of common ſalt contain magneſian ſalts, which contain a very great proportion of water neceſſary for their cryſtallization. The ſalt which we uſed was of the pureſt kind, but ſuch as may be had from every ſalt work, by Lord Dundonald’s very eaſy proceſs, viz. by paſſing through it a ſaturated ſolution boiling hot, which carries off with it about 4/5ths of all the bitter ſalts. Our aim being to aſcertain the quantities of pure ſea- ſalt, and to learn by the by its relation to water in reſpect of density, we thought it neceſſary to uſe the pureſt ſalt. We alſo dried it for ſeveral days in a ſtove, ſo that it contained no water not abſolutely neceſſary for its cryſtallization. An ounce of ſuch ſalt will com­municate a greater ſpecific gravity to water than an ounce of a salt that is leſs pure, or that contains extra­neous water.

The ſpecific gravity 1,090 is that of ordinary pickles, which are eſtimated as to ſtrength by floating an egg.

We cannot raiſe the ſpecific gravity higher than 1,206 by simply diſſolving ſalt in cold water. But it will become much denſer, and will even attain the ſpe­cific gravity 1,240 by boiling, then holding about 366 ounces in the cubic foot of hot brine. But it will depoſit by cooling, and when of the temperature 55⁰ or 60⁰, hardly exceeds 1,206. We obtained a brine by boiling till the ſalt grained very rapidly. When it cooled to 60⁰, its ſpecific gravity was 1,2063 ; for a veſſel which held 3506 grains of distilled water held 4229 of this brine. This was evaporated to dryneſs, and there were obtained 1344 grains of ſalt. By this was computed the number interpoſed between 310 and 320 in the table. We have however raiſed the ſpecific gravity to 1,217, by putting in no more ſalt than was neceſſary for thi$ denſity, and uſing heat. It then cooled down to 60⁰ without quitting any ſalt ; but if a few grains of ſalt be thrown into this brine, it will quickly deposit a great deal more, and its denſity will decreaſe to 1,206. We find this to hold in all salts ; and it is a very inſtructive fact in the theory of cryſtallization ; it reſembles the ef­fect which a magnet produces upon iron filings in its neighbourhood. It makes them temporary magnets, and cauſes them to arrange themſelves as if they had been really made permanent magnets. Juſt ſo a cryſtal already formed diſpoſes the reſt to cryſtallize. We ima­gine that this analogy is complete, and that the forces are ſimilar in both caſes.

The above table is computed for the temperature 55⁰ ; but in other temperatures the ſtrength will be different on two accounts, viz. the expanſion of the brine and the diſſolving power of the water. Water expands about 40 parts in 1000 when heated from 60⁰ to 212⁰. Saturated brine expands about 48 parts, or 1/5th more than water; and this exceſs of expanſion is nearly proportional to the quantity of ſalt in the brine. If therefore any circumſtance ſhould oblige us to exa­mine a brine in a temperature much above 60⁰, allow­ance ſhould be made for this. Thus, ſhould the ſpeci­fic gravity of brine of the temperature 130 (which is nearly half way between 60 and 212 ) be 1,140, we muſt increaſe it by 20 (half of 40 ) ; and having found the ſtrength 24 correſponding to this corrected ſpecific gravity, we muſt correct it again by adding **1** to the ſpecific gravity for every 45 ounces of ſalt.