its heat ſhould not diminiſh) ſome water muſt be let go. What may be its quantity we know not ; but it *may be more* than what would now become elaſtic by this diminution of surrounding preſſure ; and it is not unlikely but this may have ſome effect in producing the veſicles which we found ſo difficult to explain. Theſe may be filled with pure watery vapour, and be floating in a fluid compoſed of water diſſolved in air. An experiment of Fontana’s ſeems to put this matter out or doubt. A distilling apparatus AB (fig. 4.) was ſo contrived, that the heat was applied above the ſurface of the water in the alembic A. This was done by incloſing it in another veſſel CC, filled with hot wa­ter. In the receiver B there was a sort of barome­ter D, with an open ciſtern, in order to ſee what preſſure there was on the ſurface of the fluid. While the receiver and alembic contained air, the heat applied at A produced no ſenſible diſtillation during ſeveral hours : But on opening a cock E in the receiver at its bottom, and making the water in the alembic to boil, steam was produced which ſoon expelled all the air, and followed it through the cock. The cock was now ſhut, and the whole allowed to grow cold by removing the fire, and applying cold water to the alembic. The barometer fell to a level nearly. Then warm water was allowed to get into the outer veſſel CC. The ba­rometer roſe a little, and the diſtillation went on brilkly without the ſmalleſt ebullition in the alembic. The concluſion is obvious : while there was air in the receiver and communicating pipe, the diſtillation proceeded en­tirely by the diſſolving power of this air. Above the water in the alembic it was quickly ſaturated; and this ſaturation proceeded slowly along the ſtill air in the communicating pipe, and at laſt might take place thro’ the whole of the receiver. The ſides of the receiver being kept cold, ſhould condenſe part of the water diſ­ſolved in the air in contact with them, and this ſhould trickle down the ſides and be collected. But any per­lon who has obſerved how long a cryſtal of blue vi­triol will lie at the bottom of a glaſs of ſtill water be­fore the tinge will reach the ſurface, will ſee that it muſt be next to impoſſible for diſtillation to go on in theſe circumſtances ; and accordingly none was obſer­ved. But when the upper part of the apparatus was filled with pure watery vapour, it was ſupplied from the alembic as faſt as it was condenſed in the receiver, juſt as in the pulſe glaſs.

Another inference which may be drawn from theſe experiments is, that Nature ſeems to affect a certain law in the dilatation of aeriform fluids by heat. They ſeem to be dilatable nearly in proportion of their preſent dilatation. For if we ſuppoſe that the vapours reſemble air, in having their elaſticity in any given tem­perature proportional to their denſity, we muſt ſuppoſe that if steam of the elasticity 60, that is, ſupporting 60 inches of mercury, were ſubjected to a preſſure of 30 inches, it would expand into twice its preſent bulk. The augmentation of elaſticity therefore is the mea­ſure of the bulk into which it would expand in order to acquire its former elaſticity. Taking the increaſe of elaſticity therefore as a meaſure of the bulk into which it would expand under one conſtant preſſure, we ſee that equal increments of temperature pro­duce neatly equal multiplications of bulk. Thus if a certain diminution of temperature diminiſhes its bulk 1/4th, another equal dimmution of temperature will diminiſh this new bulk 1/3th very nearly. Thus in our experiments, the temperatures 110⁰, 140⁰ 170⁰, 200⁰, 230 , are in arithmetical progreſſion, having equal diffe­rences ; and we ſee that the correſponding elaſticities 2,25, 5,15, 11,05, 22,62, 44,7, are very neatly in the continued proportion of 1 to 2. The elaſticity correſponding to the temperature 260 deviates conſiderably from this law, which would give 88 or 89 instead of 80 ; and the deviation increaſes in the higher temperatures. But ſtill we ſee that there is a conſiderable approximation to this law ; and it will frequently aſſiſt us to recollect, that whatever be the preſent tem­perature, an increaſe of 30 degrees doubles the elaſtici­ty and the bulk of watery vapour.

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| --- | --- | --- | --- | --- |
| That 4⁰ will increaſe the elaſticity from 1 to 11/10 | | | | |
| 8 | - | **I** | to | 11/5 |
| 10 |  | **1** | to | 11/4 |
| 121/2 | - | **I** | to | 11/3 |
| 18 | - | **I** | to | 11/2 |
| 22 |  | **I** | to | 12/3 |
| 24 | - | **I** | to | 13/4 |
| 26 | - | **I** | to | 14/5 |

This is ſufficiently exact for moſt practical purpoſes. Thus an engineer finds that the injection cools the cy­linder of a steam-engine to 192⁰. It therefore leaves a steam whole elaſticity is 3/5ths of its full elaſticity, = 18 inches <£. But it is better at all times to have recourſe to the table. Observe, too, that in the lower temperatures, *i. e.* below 110⁰, this increment of tem­perature does more than double the elaſticity.

This law obtains more remarkably in the incoercible vapours ; ſuch as vital air, atmoſpheric air, fixed air, *&c.* all of which have also their elaſticity proportional to their bulk inverſely : and perhaps the deviation from the law in steams is connected with their chemical dif­ference of conſtitution. If the bulk were always aug­mented in the same proportion by equal augmentations of temperature, the elaſticities would be accurately represented by the ordinates of a logarithmic curve, of which the temperatures are the correſponding absciſſae : and we might contrive such a ſcale for our thermome­ter, that the temperatures would be the common loga­rithms of the elasticities, or of the bulks having equal elaſticity ; or, with our preſent ſcale, we may find ſuch a multiplier *m for* the number *x* of degrees of our ther­mometer (above that temperature where the elaſticity is equal to unity), that this multiple ſhall be the com­mon logarithm of the elaſticity *y* ; ſo that *m x* = log.y.

But our experiments are not ſufficiently accurate for determining the temperature where the elaſticity is measured by 1 inch ; becauſe in theſe temperatures the elaſticities vary by exceedingly ſmall quantities. But if we take 11,04 for the unit of elaſticity, and number our temperature from 170⁰, and make *m* = 0,010035, we ſhall find the product *m x* to be very nearly the lo­garithm of the elaſticity. The deviations, however, from this law, are too great to make this equation of any uſe. But it is very practicable to frame an equa­tion which ſhall correſpond with the experiments to any degree of accuracy ; and it has been done for air in a translation of General Roy’s Meaſurement of the Baſe at Hounſlow Heath into French by Mr Prony. It is as follows ; Let x be the degrees of Reaumur’s