articles of this work. We ſhall therefore conclude this article with some other obſervations, which are also ge­neral, with reſpect to the different kinds of coercible vapours, but which have a particular relation to the following article.

Steam or vapour is an elastic fluid, whoſe elaſticſty balances the preſſure of the atmoſphere ; and it has been produced from a ſolid or liquid body raiſed to a sufficient temperature for giving it this elasticity ; that is, for causing the fluid to boil. This temperature muſt vary with the preſſure of the air. Accordingly it is found, that when the air is light (indicated by the barometer being low), the fluid will boil ſooner. When the ba­rometer ſtands at 30 inches, water boils at the tempe­rature 212⁰. If it ſtand ſo low as 28 inches, water will boil at 2081/2. In the plains of Quito, or at Gondar in Abyſſinia, where the barometer ſtands at about 21 inches, water will boil at 195⁰. Highly rectified alcohol will boil at 160⁰, and vitriolic aether will boil at 88⁰ or 89⁰. This is a temperature by no means un­common in theſe places ; nay, the air is frequently warmer. Vitriolic aether, therefore, is a liquor which can hardly be known in thoſe countries. It is hardly poſſible to preſerve it in that form. If a phial have not its ſtopper firmly tied down, it will be blown out, and the liquor will boil and be diſſipated in ſteam. On the top of Chimboracao, the human blood muſt be diſpoſed to give out air-bubbles.

We ſaid ſome time ago, that we had concluded, from ſome experiments made in the receiver of an air-pump, that fluids boil *in vacuo* at a temperature nearly 120 degrees lower than that neceſſary for their boiling in the open air. But we now ſee that this muſt have been but a groſs approximation ; for in theſe experiments the fluids were boiling under the preſſure of the vapour which they produced, and which could not be abſtracted by working the pump. It appears from the experiments of Lord Charles Cavendiſh, mentioned in the article Pneumatics, that water of the temperature 720 was converted into elaſtic vapour, which balanced a preſ­ſure of 3/4ths of an inch of mercury, and in this ſtate it occupied the receiver, and did not allow the mercury in the gauge to sink to the level. As fast as this was abſtracted by working the air-pump, more of it was pro­duced from the ſurface of the water, ſo that the preſſure continued the ſame, and the water did not boil. Had it been poſſible to produce a vacuum above this water, it would have boiled for a moment, and would even have continued to boil, if the receiver could have been kept very cold.

Upon reading theſe experiments, and ſome very curi­ous ones of Mr Nairne, in the Phil. Tranſ. vol. lxvii. the writer of this article was induced to examine more particularly the relation between the temperature of the vapour and its elaſticity, in the following manner :

ABCD (fig. 2.) is the ſection of a ſmall digeſter made of copper. Its lid, which is faſtened to the body with ſcrews, is pierced with three holes, each of which had a ſmall pipe ſoldered into it. The firſt hole was furniſhed with a braſs ſafety-valve V, nicely fitted to it by grinding. The area of this valve was exactly 1/4th of an inch. There reſted on the ſtalk at top of this valve the arm of a ſteelyard carrying a sliding weight. This arm had a ſcale of equal parts, ſo adjuſted to the weight that the number on the ſcale correſponded to the inches of mercury, whoſe preſſure on the under ſurface of the valve is equal to that of the ſteelyard on its top ; ſo that when the weight was at the diviſion 10, the preſſure of the ſteelyard on the valve was just equal to that of a column of mercury 10 inches high and 1/4th of an inch baſe. The middle hole contained a thermometer T firmly fixed into it, ſo that no vapour could eſcape by its sides. The ball of this thermometer was but a little way below the lid. The third hole received occaſionally the end of a glaſs-pipe S G F, whoſe deſcending leg was about 36 inches long. When this ſyphon was not uſed, the. hole was properly ſhut with a plug.

The veſſel was half filled with diſtilled water which had been purged of air by boiling. The lid was then fixed on, having the third hole S plugged tip. A lamp being placed under the veſſel, the water boiled, and the ſteam iſſued copiouſly by the ſaſety-valve. The ther­mometer ſtood at 213, and a barometer in the room at 29,9 inches. The weight was then put on the fifth di­viſion. The thermometer immediately began to riſe ; and when it was at 220, the ſteam iſſued by the ſides of the valve. The weight was removed to the 10th diviſion; but before the thermometer could be diſtinctly obſerved, the ſteam was iſſuing at the valve. The lamp was removed farther from the bottom of the veſſel, that the progreſs of heating might be more moderate ; and when the ſteam ceaſed to iſſue from the valve, the thermometer was at 227. The weight was now ſhifted to 15 ; and by gradually approaching the lamp, the ſteam again iſſued, and the thermometer was at 1321/2 This mode of trial was continued all the way to the 75th diviſion of the ſcale. The experiments were then re­peated in the contrary order ; that is, the weight being ſuſpended at the 75th diviſion, and the ſteam iſſuing ſtrongly at the valve, the lamp was withdrawn, and the moment the ſteam ceaſed to come out, the thermome­ter was obſerved. The ſame was done at the 70th, 65th, diviſion, &c. Theſe experiments were ſeveral times re­peated both ways ; and the means of all the reſults ſor each diviſion are expreſſed in the following table, where column lſt expreſſes the elaſticity of the ſteam, being the ſunr of 29,9, and the diviſion of the ſteelyard ; co­lumn 2d expreſſes the temperature of the ſteam correſponding to this elaſticity.

|  |  |
| --- | --- |
| 1. | II |
| 35 inches. | 219⁰ |
| 40 | 226 |
| 45 | 232 |
| 50 | 257 |
| 55 | 242 |
| 60 | 247 |
| 65 | 251 |
| 70 | 255 |
| 75 | 239 |
| 80 | 263 |
| 85 | 267 |
| 90 | 270 1/2 |
| 95 | 2741/2 |
| 100 | 278 |
| 105 | 281 |

A very different proceſs was necessary for aſcertaining the elaſticity of the ſteam in lower temperatures, and conſequently under ſmaller preſſures than that of the atmoſphere. The glaſs ſyphon SGF was now fixed into its hole in the lid of the digeſter. The water was made to boil ſmartly for ſome time, and the ſteam iſſued copiouſly both at the valve and at the ſyphon. The