lower end of the ſyphon was now immerſed into a broad ſaucer of mercury, and the lamp inſtantly removed, and every thing was allowed to grow cold. By this the ſteam was gradually condenſed, and the mercury roſe in the ſyphon, without ſenſibly sinking in the ſau­cer. The valve and all the joints were ſmeared with a thick clammy cement, compoſed of oil, tallow, and roſin, which effectually prevented all ingreſs of air. The weather was clear and froſty, the barometer ſtanding at 29,84, and the thermometer in the veſſel at 42⁰. The mercury in the ſyphon ſtood at 29,7, or ſomewhat higher, thus ſhowing a very complete condenſation. The whole veſſel was ſurrounded with pounded ice, of the temperature 32⁰. This made no ſenſible change in the height of the mercury. A mark was now made at the ſurface of the mercury. One obſerver was ſtationed at the thermometer, with inſtructions to call out as the thermometer reached the diviſions 42, 47, 52, 57, and ſo on by every five degrees till it ſhould attain the boiling heat. Another obſerver noted the corre­ſponding deſcents of the mercury by a ſcale of inches, which had its beginning placed at 29,84 from the ſur­face of the mercury in the ſaucer.

The pounded ice was now removed, and the lamp placed at a considerable diſtance below the veil’d, ſo as to warm its contents very ſlowly. Theſe obſervations being very easily made, were ſeveral times repeated, and their mean reſults are ſet down in the following table : Only obſerve, that it was found difficult to note down the deſcents for every fifth degree, becauſe they ſucceeded each other ſo faſt. Every 10th was judged ſufficient for eſtabliſhing the law of variation. The firſt column of the table contains the temperature, and the ſecond the deſcent (in inches) of the mercury from the mark 29,84.

|  |  |
| --- | --- |
| 32⁰ | $ |
| 40 | 0,1 |
| 50 | 0,2 |
| 60 | 0,35 |
| 70 | 0,55 |
| 80 | 0,82 |
| 90 | 1,18 |
| 100 | 1,61 |
| **110** | 2,25 |
| 120 | 3,00 |
| 130 | 3>95 |
| 140 | 5,15 |
|  | 6,72 |
| 160 | 8,65 |
| 170 | 11,05 |
| 180 | 14,05 |
| 190 | 17,85 |
| 200 | 22,62 |
| 210 | 28,65 |

Four or five numbers at the top of the column of elaſticities are not ſo accurate as the others, becauſe the mercury paſſed pretty quickly through theſe points. But the progreſs was extremely regular through the re­maining points ; ſo that the elaſticities correſponding to temperatures above 70⁰ may be conſidered as very ac­curately aſcertained.

Not being altogether ſatisfied with the method em­ployed for meaſuring the elaſticity in temperatures above that of boiling water, a better form of experiment was adopted. (Indeed it was the want of other apparatus which made it neceſſary to employ the former). A glaſs tube was procured of the form repreſented in fig. 3. ha­ving a little ciſtern L, from the top and bottom of which proceeded the ſyphons K and MN. The ciſtern contained mercury, and the tube MN was of a slender bore, and was about six feet two inches long. The end K was firmly fixed in the third hole of the lid, and the long leg of the ſyphon was furniſhed with a ſcale of inches, and firmly faſtened to an upright poſt.

The lamp was now applied at ſuch a diſtance from the veſſel as to warm it ſlowly, and make the water boil, the ſteam eſcaping for ſome time through the ſafety valve. A heavy weight was then ſuſpended on the ſteelyard ; ſuch as it was known that the veſſel would ſupport, and at the ſame time, ſuch as would not allow the ſteam to force the mercury out of the long tube. The thermometer began immediately to riſe, as alſo the mercury in the tube MN. Their correſpondent ſtations are marked in the following table :

|  |  |
| --- | --- |
| Temp. | Elasty. |
| 212⁰ | 0,0 |
| 220 | 5,9 |
| 230 | 14,6 |
| 240 | 25,0 |
| 250 | 36,9 |
| 260 | 50,4 |
| 270 | 64,2 |
| 280 | 106,0 |

This form of the experiment is much more ſuſceptible of accuracy than the other, and the meaſures of elaſticity are more to be depended on. In repeating the experi­ment, they were found much more constant ; whereas, in the former method, differences occurred of two inches and upwards.

We may now connect the two ſets of experiments into one table, by adding to the numbers in this laſt table the conſtant height 29,9, which was the height of the mercury in the barometer during the laſt ſet of obſer­vations.

|  |  |
| --- | --- |
| Temp. | Elasty. |
| 32⁰ | 0,0 |
| 40 | 0,1 |
| 50 | 0,2 |
| 60 | 0,35 |
| 70 | 0,55 |
| 80 | 0,82 |
| 90 | 1,25 |
| 100 | 1,6 |
| 110 | 2,25 |
| 120 | 3,0 |
| 130 | 3’95 |
| 140 | *5,15* |
| 150 | *6,72* |
| 160 | 8,65 |
| 170 | 11,05 |
| 180 | 14,05 |
| 190 | 17,85 |
| 200 | 22,62 |
| 210 | 28,65 |
| 220 |  |
| 230 | 44,7 |
| 240 | 54,9 |
| 25O | 66,8 |
| 260 | 80,3 |
| 270 | 94,A |
| 280 | 105,0 |