equal in quantity to that which diſappears from the tea­kettle.

This is evidently the common proceſs for diſtilling ; and the whole appearances may be explained by ſayin'g, that the water is converted by heat into an elaſtic va­pour, and that this, meeting with colder air, imparts to it the heat which it carried off as it aroſe from the heat­ed water, and being deprived of its heat it is again wa­ter. The particles of this water being vaſtly more re­mote from each other than when they were in the tea­kettle, and thus being diſſeminated in the air, become viſible, by reflecting light from their anterior and poſte­rior ſurfaces, in the ſame manner as a tranſparent ſalt becomes viſible when reduced to a fine powder. This diſſeminated water being preſented to the air in a very -extended ſurface, is quickly diſſolved by it, as pounded salt is in water, and again becomes a tranſparent fluid, but of a different nature from what it was before, be­ing no longer convertible into water by depriving it of its heat.

Accordingly this opinion, or ſomething very like it, has been long entertained. Muſchenbroeck expreſsly ſays, that the water in the form of vapour carries off with it all the heat which is continually thrown in by the fuel. But Dr Black was the first who attended minutely to the whole phenomena, and enabled us to form diſtinct notions of the ſubject. He had diſcovered that it was not sufficient for converting ice into water that it be raiſed to that temperature in which it can no longer remain in the form of ice. A piece of ice of the temperature 32⁰ of Fahrenheit’s thermometer will remain a very long while in air of the temperature 50o before it be all melted, remaining all the while of the temperature 32⁰, and therefore continually absorbing hear from the ſurrounding air. By comparing the time in which the ice had its temperature changed from 28⁰ to 32⁰ with the ſubſequent time of its complete lique­faction, he found that it abſorbed about 130 or 140 times as much heat as would raiſe its temperature one degree ; and he found that one pound of ice, when mixed with one pound of water 140 degrees warmer, was just melted, but without riſing in its temperature above 32⁰. Hence he juſtly concluded, that water dif­fered from ice of the fame temperature by containing, as a conſtituent ingredient, a great quantity of fire, or of the cauſe of heat, united with it in ſuch a way as r.ot to quit it for another colder body, and therefore ſo as not to go into the liquor of the thermometer and expand it. Conſidered therefore as the poſſible cauſe of heat, it was latent, which Dr Black expreſſed by the abbreviated term latent heat. If any more heat was added to the water it was not latent, but would readily quit it for the thermometer, and, by expanding the thermometer, would ſhow what is the degree of this r*edundant* heat, while fluidity alone is the indica­tion of the *combined* and latent heat

Dr Black, in like manner, concluded, that in order to convert water into an elaſtic vapour, it was neceſſary, not only to increaſe its uncombined heat till its tempe­rature is 212⁰, in which ſtate it is just ready to become elaſtic ; but alſo to pour into it a great quantity of fire, or the cauſe of heat, which combines with every particle of it, ſo as to make it repel, or to recede from, ſt3 adjoining particles, and thus to make it a particle ot an elastic fluid. He ſuppoſed that this additional heat might be combined with it ſo as not to quit it for the thermometer; and therefore ſo as to be in a latent ſtate, having elaſtic fluidity for its sole indication.

This opinion was very conſiſtent with the phenome­non of boiling off a quantity of water. The applica­tion of heat to it cauſes it gradually to rife in its tem­perature till it reaches the temperature 212⁰. It then begins to ſend off elaſtic vapour, and is ſlowly expend­ed in this way, continuing all the while of the ſame temperature. The fleam alſo is of no higher tempera­ture, as appears by holding a thermometer in it. We muſt conclude that this fleam contains all the heat which is expended in its formation. Accordingly the ſealding power of steam is well known ; but it is ex­tremely difficult to obtain preciſe meaſures of the quan­tity of heat abſorbed by water during its converſion in­to fleam. Dr Black endeavoured to aſcertain this point, by comparing the time of railing its temperature a cer­tain number of degrees with the time of boiljng it off by the ſame external heat ; and he found that the heat latent in ſteam, which balanced the preſſure of the at- moſphere, was not less than 80o degrees. He alſo di­rected Dr Irvine of Glaſgow to the form of an experi­ment for meaſuring the heat actually extricated from ſuch ſteam during its condenſation in the refrigeratory ot a Hill, which was found to be not leſs than 774 de­grees. Dr Black was afterwards informed by Mr Watt, that a courſe of experiments, which he had made in each oſ theſe ways with great preciſion, determined the latent heat of fleam under the ordinary preſſure of the atmosphere to be about 948 or 950 degrees. Mr Watt alſo found that water would distil with great eaſe *in vacuo* when of the temperature 70°; and that in this cafe the latent heat of the fleam is not leſs than 1200 or 1300 degrees : and a train of experiments, which he had made by diſtilling in different temperatures, made him conclude that the ſum of the ſenſible and latent heats is a confiant quantity. This is a curious and not an improbable circumstance ; but we have no informa­tion of the particulars of theſe experiments. The con- cluſion evidently preſuppoſes a knowledge of that par­ticular temperature in which the water has no heat ; but this is a point which is still *ſub judice.*

This converſion of liquids (for it is not confined to water, but obtains alſo in ardent ſpirits, oils, mercury, &c.) is the cauſe of their boiling. The heat is applied to the bottom and fiées of the veſſel, and gradually ac­cumulates ,in the fluid, in a ſenſible ftate, uncombined, and ready to quit it and to enter into any body that is colder, and to diffuſe itſelf between them. Thus it en­ters into the fluid of a thermometer, expands it, and thus gives us the indication of the degree in which it has been accumulated in the. water ; for the thermometer ſwells as long as it continues to abſorb ſenſible heat from the water : and when the ſenſible heat in both is in equilibrio, in a proportion depending on the nature of the two fluids, the thermometer rises no more, becauſe it abſorbs no more heat or fire from the water ; for the particles of water which are in immediate contact with the bottom, are now (by this gradual expansion of liqui­dity) a ſuch distance from each other, that their laws of attraction for each other and for heat are totally changed Each particle ei her no longer attracts, or perhaps it repels its adjoining particle, and now accu­mulates round itſelf a great number of the particles of