

and the second a lower temperature v' , we see that the quantity of heat which it receives through the first surface depends on the difference $v - v'$, and is proportional to it: but this remark is not sufficient to complete the calculation. The quantity in question is not a differential: it has a finite value, since it is equivalent to all the heat which escapes through that part of the external surface of the prism which is situate to the right of the section. To form an exact idea of it, we must compare the lamina whose thickness is dx , with a solid terminated by two parallel planes whose distance is e , and which are maintained at unequal temperatures a and b . The quantity of heat which passes into such a prism across the hottest surface, is in fact proportional to the difference $a - b$ of the extreme temperatures, but it does not depend only on this difference: all other things being equal, it is less when the prism is thicker, and in general it is proportional to $\frac{a - b}{e}$. This is why the quantity of heat which passes through the first surface into the lamina, whose thickness is dx , is proportional to $\frac{v - v'}{dx} \cdot \frac{dT}{dx}$.

We lay stress on this remark because the neglect of it has been the first obstacle to the establishment of the theory. If we did not make a complete analysis of the elements of the problem, we should obtain an equation not homogeneous, and, *a fortiori*, we should not be able to form the equations which express the movement of heat in more complex cases.

It was necessary also to introduce into the calculation the dimensions of the prism, in order that we might not regard, as general, consequences which observation had furnished in a particular case. Thus, it was discovered by experiment that a bar of iron, heated at one extremity, could not acquire, at a distance of six feet from the source, a temperature of one degree (octogesimal¹); for to produce this effect, it would be necessary for the heat of the source to surpass considerably the point of fusion of iron; but this result depends on the thickness of the prism employed. If it had been greater, the heat would have been propagated to a greater distance, that is to say, the point of the bar which acquires a fixed temperature of one degree is

¹ Reaumur's Scale of Temperature. [A. F.]