LV. On the expansion of wood by heat

David Rittenhouse LL.D.

To cite this article: David Rittenhouse LL.D. (1801) LV. On the expansion of wood by heat , Philosophical Magazine Series 1, 10:40, 343-345, DOI: [10.1080/14786440108675938](https://doi.org/10.1080/14786440108675938)

To link to this article: <http://dx.doi.org/10.1080/14786440108675938>

Published online: 18 May 2009.

Submit your article to this journal [↗](#)

Article views: 2

View related articles [↗](#)

sea, the blades, which the acidity of the atmosphere rusts and destroys when made of iron, would be preserved from that inconvenience.

I shall terminate this extract with some reflections on the price of metals in the time of Pliny. Lead at Rome, during the first century of our æra, was worth twenty-four times the price at which it is sold at present at Paris, and tin eight times its present price; so that lead was three times as dear there as tin, while among us it does not cost a third of the price. The comparative dearth of these metals among the ancients must make us sensible of the advantage which more extensive commerce, and metallurgic labours conducted in a more scientific manner, give us over them. But we ought not to forget that this advantage is the result of eighteen centuries of experience and improvement; and that, notwithstanding this great number of centuries, the ancients are still our masters in that part of literature, and the fine arts, which forms the peculiar domain of the imagination.

LV. *On the Expansion of Wood by Heat.* By DAVID RITTENHOUSE, LL. D. *President of the American Philosophical Society* *.

IN the present state of experimental philosophy it is well known that bodies in general enlarge their dimensions, or expand, on being heated, and contract in cooling. From some experiments heretofore made, wood has been thought to make an exception to the general rule, and this opinion has so prevailed that many curious persons have applied wooden pendulum rods to their time-pieces, to prevent the variation in their rate of going, arising from the expansion and contracting of a metal rod. From my own observations, however, as well as those of some of my friends, the wooden pendulum rod does not appear to answer the expectations formed on it. I had in my possession for several years an excellent time-piece made for this society by an ingenious workman and worthy member of the society. The result of my constant attention to this clock was, that, though its regular variations with heat and cold were probably much less than those of metal pendulums, it nevertheless went always faster in winter than in summer, and was liable to very sudden and considerable variations; arising, no doubt, from the combined effects of heat and cold,

* From the *Transactions of the American Philosophical Society.*

moisture and dryness. This determined me to make some careful experiments with a pyrometer capable of receiving a piece of wood of the length of a second pendulum. Several years ago I made some experiments of this kind, perfectly corresponding with those I have lately made, and which I now communicate to the Society.

I took a straight-grained piece of white hickory, green, for I could not procure any seasoned, its length 39 inches, and about $\frac{3}{8}$ ths of an inch square. This I placed in my pyrometer, and kept it fully extended by a weight fastened to a string, going over a pulley. To the pyrometer I applied the tube and glasses of a good compounded microscope, and a micrometer, the value of the smaller divisions whereof I found to be nearly .00053 parts of an inch each.

The rod of wood being placed in the pyrometer, I poured sand all around it, heated to about 250 of Fahrenheit, which degree of heat I found the wood would bear without scorching. On pouring in the hot sand, the rod expanded very much, but soon began to contract, even before the sand was sensibly cooled, which I suppose arose from the hot sand extracting the moisture of the wood. It continued to contract as the whole grew cool, so that when the rod had acquired its first temperature it was near 30 of the above divisions shorter than at first. I repeated the operation a second and third time, and had then reason to conclude that the wood was nearly as dry as it would become by lying long in a dry air. I now let it cool to the temperature of the atmosphere, which was 75°, and heating the sand to 200 only, I poured it around the rod. In a few minutes it expanded 16 divisions. In half an hour the sand had cooled to 125, and the rod had contracted 11 divisions. In an hour more the sand was 80, and the rod shortened full 4 divisions more, being nearly equal to its length when the sand was first applied. On the whole I conclude, that very dry wood expands with heat pretty regularly, though certainly in a much less degree than any of the metals, or even glasses.

The rod above mentioned having been kept in a dry place for twelve months, I again tried it with the pyrometer, having fixed near one end of it a small graduated scale of ivory, 360 divisions whereof were equal to one inch. This scale was viewed with the microscope, furnished with a cross hair, and I thought this method preferable to the screw micrometer used before.

The rod was placed in the pyrometer when the temperature of the air was about 60°. On pouring sand around it, heated a little higher than boiling water perhaps, it immediately expanded

panded half a division, but in less than a minute it began to contract, and continued to do so for an hour, when I drew off the sand. It was now full 10 divisions shorter than at first, so that it had imbibed a great deal of moisture from the air, which it again parted with to the heated sand. Three hours afterwards, when the rod was cool, I again poured the sand on it, heated as before. It now continued to expand for about three minutes, when its length was increased $3\frac{1}{2}$ divisions, it then began to contract, and became full 3 divisions shorter than when the sand was poured on it. I caused the sand to run off once more, and let the rod cool. Then heating the sand 250° by a thermometer, I poured it on the rod, and in a few minutes it expanded $3\frac{3}{4}$ divisions, it then began to contract slowly, and in 15 minutes it became 2-3ds of a division shorter than at first. On the whole, I concluded that the expansion of wood, in its length, will be irregular, corresponding partly to the warmth, and partly to the moisture of the atmosphere.

LVI. *Observations on the Means of detecting the Presence of Lead in Wine.* By C. O. REINECKE *.

TO gratify sordid avarice at the expense of the health of mankind, by communicating to four wines a fallacious sweetness by means of the oxide of lead, is a crime which for the dignity of the human race we shall suppose to be committed rather through ignorance than want of principle. Half a bottle of Chably wine was lately sent me to test, with a notice, that a person, whose opinion, on account of his talents, was entitled to great respect, had tried this wine, and believed that he had found in it oxide of lead. To accomplish the object in view I employed the following means:

1st, After being assured that the seal with which the correspondent had marked the half bottle was in good preservation, I began to examine the physical properties of the wine it contained. It was perfectly clear, had scarcely any colour, and had formed no deposit. The taste of this liquor alone convinced me that it had not experienced that adulteration of which it was suspected; it had that pure and pungent taste, which is so much liked in Chably wine, without the slightest trace of that perfidious sweetness communicated by acetite of lead, and which always betrays itself by a styptic relish, however small may have been the quantity of this poison mixed with the liquor.

* From the *Annales de Chimie*, No. 114.