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THE LAW OF CONTRACTION AND EXPANSION IN RELATION TO WOOD.

(Written for the Canada Lumberman.)

The expansion and contraction of all mineral substances is governed by heat. The law is that increase of heat increases bulk; and conversely a diminution of heat is accompanied by diminished bulk. Metal workers necessarily understand this. The scientist by means of his wide range of careful experiments, knows its exact action, and the breadth of its scope, much more fully and completely; but both are nearly even as to the reason why, and the particular manner by which, this law operates. It would seem that the ultimate atoms of all inorganic matter, whether solid, liquid or gaseous, were kept, in some way, at a certain respectful distance from each other, according to the degree of heat interposed; and when this heated condition arrives at a certain stage these atoms or particles, become so loosely connected that they begin to flow. Instance, melted iron, the liquid lava flowing down the mountain side, or mercury, or water, which have their fluid condition at ordinary temperatures.

This is the law of expansion as it relates to the inorganic or mineral world. In the animal and vegetable kingdoms, it proceeds on a different principle; moisture not heat, is here, the controlling power. Here too, our knowledge of the why and wherefore is extremely limited. We are here approaching one of the hidden places of nature's secrets, into which we can do little more than peep and guess. In this case the most obvious conclusion is, that the particles of water (that very common substance, of which we see so much yet know so little) by interposing themselves in and among the cells and fibres of animal and vegetable structures play, to some extent, the role in the organic world, of the increments of heat in the mineral kingdom. The application of heat to wood, or vegetable matter of any kind, instead of expanding shrinks it, this is done by evaporating and expelling the moisture contained in it. This brings us to the practical bearing of our subject; to the question that interests the lumberman and woodworker: Precisely in what manner, what direction, and to what extent does lumber shrink? It is generally considered that it does not shrink endwise, and for most all practical purposes this is correct, yet any one accustomed to hardwood lumber will know by its action in seasoning that it must shrink endwise. Let a number of hardwood scantling be laid close together on the top of a pile, the upper side having the principal exposure, in a few days it will be found that the ends have curved upwards. This will certainly be the case if the heart side of the scantling is laid downwards, showing that the drying process shortens the upper side, and, of course, draws up the ends. Besides, I once saw a clear demonstration, with a thin strip of pine in

which the difference of length between the wet and dry conditions was unmistakable. Still clockmakers sometimes use wood for their pendulum rods. Red cedar, perhaps, retains its uniformity better than any wood of my acquaintance.

There is another direction in which wood contracts but little, that is radially or in a direct line from the bark to the heart. If we should saw off a short piece of a straight grained hardwood tree, strip it of its bark, measure its diameter and leave it exposed to dry, when fairly seasoned another measurement will show but little change, but the large radial cracks indicate most clearly which way the shrinkage has taken place. The cells and fibres of the wood have closed together circumferentially, and the resistance to a corresponding radial contraction, has been so stubborn that the timber has pulled itself apart rather than allow a reduction of its diameter.

Take another example: Get a piece of green maple, beech or oak, turn it to say five inches diameter, lay away till thoroughly seasoned, then measure again, and we shall still find it close to five inches in the radial direction at right angles to this, the diameter will be reduced nearly one-eighth of an inch. Its oval cross section will be manifest at a glance. Why this is thus would be an interesting question, one which I have no recollection of ever seeing answered. I think the solution will be found in connection with the medullary rays, which though present in all our northern trees are particularly conspicuous in the grain of the oak, beech and sycamore. They are scarcely distinguishable in balsam, poplar and some other soft woods, which also have correspondingly the character of more uniform shrinkage.

Another important question is, why do boards warp in the process of seasoning? Boards which have the heart of the tree at one edge and the bark at the other do not warp; what shrinkage they may have is in thickness, not in width. There is consequently no particular tendency to warp. But now let us take a board from the side of a log, say a first or second cut so that the air may circulate freely around it, and it will be free to assume the form which it is disposed to take. When seasoned it will invariably be concave on the side towards the bark and convex on the heart side. This is accounted for by the action we have already referred to—circumferential shrinking. In order to understand its action we must regard the centre of the tree as a fixed point, and lines radiating therefrom as being rigid, and the direction of the shrinkage to be always at right angles to these lines, and as having the effect of diminishing their angles without changing their length; as a consequence we have the curvature described. This action can be illustrated by a lady's paper fan, which after expan-

ding it to its full extent we take a pair of shears and clip off a segment. Now allow it to contract slightly and it will be seen that the line of the cut is no longer straight but concave. The methods of piling to a large extent prevent this warping, but it is really only postponed, afterwards when planed, and left free, or if wetted and redried, like a criminal set at liberty soon asserts its disposition to crookedness. Some of the patent methods of lumber drying disregard this. It remains to be seen whether or not they win the victory over nature.

Now I imagine the practical readers of the Lumberman asking the question, What does all this knowledge amount to? What can we do about it? Are not our present methods for cutting and handling lumber about the best that can be devised for the present demand? Taken in the main this question can not be squarely negatived. Yet for many purposes our sawing methods are wholly and radically wrong. Mill men are not particularly to blame, they make lumber to make money, and the easiest, readiest way is the best way. The dealer buys and sells with the same object in view. Neither party pays much attention to the fine points, in the science or art of their business, so long as a patient public purchases and pays, but if the house owners do not they might well ask the questions: Is it a necessity, that the siding on our houses must warp, and crack and split; that our floors must have a receptacle for dirt between every board, from an eighth to one-quarter of an inch wide; also that they must be continually brooming up and peeling, so that no paint will stay on them. Must the baseboards around our rooms be always gaging wide at the floor and where they join the wall, and our doors be shrinking and swelling with every change of the season? It may be said that this results simply from imperfect seasoning, which is largely true, but if the lumber was rightly sawn the seasoning process would not materially change its width or general shape. The general style of sawing in from the four sides of the log, is just the right method to produce warping, shrinking, and changeable boards.

If it is asserted that this is the only practicable method of sawing lumber, we take exception to it, and say it may serve best for many purposes, but for many other higher uses there are better methods. This question of methods will be reserved for another issue.

W. H. TROUT.

Milwaukee, June 9, 1884.

HOUSE BUILDING AND THE LUMBER TRADE.

One of the most encouraging signs of the times to the handlers of lumber is the prevailing house building inclination. There seems to be a kind of house building passion that has possessed the minds of the people. This has

materialized in the form of building associations. It is a poor little town indeed, these days, that does not have one or more building associations. People who earn their living by sweat of brow or rack of brain have come to think that there is no other so safe a place to keep money as to have it nailed or mortared into solid walls, and covered by reliable insurance. Building associations enable men of moderate income to save a little money every month, which not only earns interest and dividends, but helps to provide money for building homes. More men now than ever before are touting under the inspiration that these savings give them. Out of the scheme thousands of dwellings and business houses are constantly rising all over this country and the Canadas. If there is no abatement of the impulse—and it is to be hoped there will not be—the building industry cannot but continue prosperous, and the use of lumber and all building material will increase.—*Northwestern Lumberman.*

A Wrinkle.

A subscriber, who has had many years of experience in the lumber business, informs the *Lumberman's Gazette*, that it would be a great preventive of the destruction of timber blown down last fall to peel a narrow strip of bark on the top of every down tree, as it lets the water in so as to prevent the worms from spoiling the timber as they will not work in such cases.

Timber in the South.

The south is now making special efforts to develop its lumber industry. Vast regions of "virgin forests" still abound there, and at the coming New Orleans Exposition a full exhibit of the woods of southern forest will be made. Tennessee, Georgia, Alabama, Louisiana and Arkansas, will probably be represented. Hemlock, cherry, maple, poplar, chestnut, ash, white and yellow pine, cedar and white and black oak are said to abound in the states mentioned, "with the price of land at a very low figure."—*Lumberman's Gazette.*

Rosewood and Mahogany.

Rosewood and mahogany for furniture are gradually coming again into large use. Five cargoes of mahogany arrived at New York week before last and all were quickly marketed. An exchange says that the time is not distant when New York will be the largest mahogany receiving port in the world. This is a commentary upon the changes that have taken place within a comparatively short time. It is but a few years ago since half a dozen cargoes arriving in a month would have overstocked the market. Now as many as that in a week makes no impression on the market, and all that comes forward, is quickly absorbed.—*Lumberman's Gazette.*