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BY THE WAY.

OUR friend ELI, whose nose for news is keen, regales LUMBERMAN readers this month with several stories illustrative of the large advances made in the price of Canadian timber within a comparatively few years. These may be taken, perhaps, as supplementary to others that have appeared in these columns at different times and that could easily be further extended. They all go to show what a valuable asset the country holds in its timber limits. If the advance has been so great in the past, what may be expected in the future as the forests become more and more denuded? This question may seem inconsistent to some in the light of the depression that hangs over lumber at the present moment. But this, as a second thought promptly suggests, is only momentary, and as is pointed out elsewhere in these columns, has its origin in causes foreign to the lumber trade itself. The condition is one that gives strength to those who tell us that Canadians should go slow in allowing to pass out of their possession this valuable heritage.

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In the cutting of timber the lumberman is getting deeper into the interior, and further away from civilization each year. It does not appear long ago when, so to speak, the timber was at one's door. Our Ottawa correspondent tells us that some of the logs that have reached the Capital this season have travelled a distance of 425 miles. This is a long drive. It is hardly to be expected, however, that conditions will become any better in this respect. The lumber mills of the Chaudiere will, in the future, draw their supplies of logs from increasingly greater distances. Similarly changed conditions exist in the Georgian Bay and other northern lumber territories of the province. The logs have been steadily removed further from the saw, and some of the changes that have taken place in the mills in that section have been due to this fact. It will no longer pay to bring logs the distance now of some mills, and these have been closed and the cutting is being done nearer to the saw.

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It is not to be supposed that the rapid denudation of the forests in Canada is exceptional to this country. Maine, Pennsylvania and New York state were rich at one time in pine, but they are practically bare to-day. The timber countries of the old world have had visited on them a similar experience. We do not know why in some respects anything different should be expected. To the lumberman who pays a large sum for his timber berths the practical value is in the cutting and marketing of the timber they contain. It may increase in value by being allowed to stand and judging by the figures in the ELI page this unearned increment grows into large and profitable sums. But in this case the value is after all in the prospective price of the timber when it shall have been cut. The difference between the older countries and the newer continent is in the careful and scientific effort that is made to preserve the forests so that they shall not become wholly extinct. The lessons of *Germany, France, India, and in part Great Britain, are* deserving of closer study and practice in these particulars than they have yet received on this continent. Michigan, Wisconsin and Minnesota are not in that position yet, but the cut runs into large figures each year and the supply is not limitless there any more than in Maine, New York or Pennsylvania. It may be said, on the strength of competent authority, that Michigan white pine is almost a thing of the past even now.

POWER STEAM.

EVERY man should know his own business. Not a small percentage of the failures that occur in commercial and manufacturing lines is due to the inexperi*ence of the men who undertake to operate the business.* When it comes to mechanical vocations, there are so many contingencies that may arise, that this remark applies with redoubled force. The question is discussed with clearness and ability in the Mechanical News with a special reference to steam. The remark of our contemporary is that the architect who undertakes to erect a building, or the mechanic who constructs an engine, without first obtaining a full knowledge of the properties and nature of the material used in such building, is almost sure to fail; and the engineer who takes charge of a steam engine, or uses steam for any purpose in mechanics or manufactures, should first acquaint himself with its nature and properties.

What then is steam? What are its natural chemical composition and properties? The Mechanical News answer these questions in these terms:

Water is looked upon by many as a common and simple element; and the mode of converting it into steam is known by every school boy of the present age. Not so with the constituents and properties when in the gaseous form. The analysis of steam, such as is usually generated in the ordinary steam boiler, has yet to be made, and consequently many vague theories and ideas are advanced. We can safely affirm that ice water and steam are one and the same substance, only that they are of different degrees of temperature. Then it is evident that the temperature gives different properties to the same substance.

The highest point to which ice can be raised and maintained as ice is 32 degrees Fah., but the highest to which water and steam can be raised has not yet been accurately ascertained. We know that at atmospheric pressure water evaporates into what is known as steam at 212 degrees, and above or below that point in accordance with the pressure to which it is subjected, and in proportion to the units of heat applied. Steam and water can exist in their respective forms at all temperatures above 32 degrees Fah., and in fact steam is known to exist much below the freezing point. We may say, just at this point, that we make no distinction between what is called vapor and steam; in fact, there is none, except temperature.

If the temperature of the air should fall sufficiently below that of the water in our bays and rivers steam would be given off from their surfaces, and become visible when condensed in the colder atmosphere. Steam can be condensed from the atmosphere by any cold substance being placed in it. A pitcher filled with ice will illustrate this. Steam is given off from our bodies at nearly the same temperature as the air. To prove this we have only to breathe on a piece of cold metal or glass, when condensation ensues and the water can easily be collected. When the atmosphere is much colder than our bodies this steam is made visible by condensation, and when the temperature is sufficiently low, has been frozen into ice upon the beard.

We have said here that steam was made visible, but when visible it is no longer steam, but minute globules *of water, of infinitely small proportions*, which, by their attraction for each other, under favorable conditions, form drops and fall in rain, or are evaporated again and carried off in the thirsty atmosphere.

Pure steam is composed of two volumes of hydrogen and one of oxygen; or, by weight, one of hydrogen and eight of oxygen. If two cubic feet of hydrogen and one of oxygen are united, they will form only two cubic feet of steam, or a volume equal to that of the hydrogen and equal in weight to both. Steam is three-eights lighter than common air. An atmosphere of pure steam would only weigh a little over nine pounds, yet water, of which it is composed, is 770 times heavier than air, it being in weight as 1, nitrogen 14 and oxygen 16.

The *thermometer, being the instrument generally* used for measuring degrees of heat, might be more properly termed degrees of expansion and contraction in the liquid or metal used in its construction. Quantity of heat cannot be measured by the thermometer, although it is indicated by the expansion of the material of which the thermometer is composed, to be either more or less intense. The galometer is the most sensitive instrument in use for measuring minute differences in temperature. This instrument will not indicate quantity, but will indicate or detect the presence of heat, though insensible to the ordinary thermometer. The calorimeter is a device for measuring quantity. It consists of a glass vessel having two annular chambers, the inner one to contain the liquid or material to be tested; the other two chambers to contain pounded ice; the outer chamber of ice to prevent the action of the heat in the surrounding air from acting on the ice in the middle chamber. The quantity of heat is then obtained by the quantity of ice. The substance under test will dissolve in the middle chamber, and can be ascertained by the weight of water thus collected from the ice in the middle chamber; yet this will not give accurate quantity, as all the ice thus dissolved cannot be collected, a portion of the water being retained in the ice by capillary attraction, even though no heat were lost while conducting the operation.

Watt gives the latent heat of steam at one atmosphere as 988 degrees; at ten atmospheres as 840 degrees, Watt's theory being that 1200 degrees is the total heat contained in saturated steam, and that as sensible heat increases latent heat diminishes. In measuring the quantity of heat contained in steam the ordinary thermometer is useless. An approximation to quantity is made as follows: One cubic inch of water generated into steam contains sufficient heat to raise the temperature of 5½ cubic inches from 32 degrees Fah. to 212 degrees, making in all, when condensed, 6½ inches of water at 212 degrees, yet the steam only indicated 212 degrees. Hence if we multiply 6½ by 212 degrees, and deduct the 32 degrees contained in the 5½ inches of water, we will have 1202 degrees as the amount of heat obtained from 1700 cubic inches of steam, or the amount necessary to evaporate one cubic inch of water into steam, yet the steam will indicate, by the thermometer, as having only received 108 degrees, when, as shown by the calculation, it has received 1170 degrees and yielded up to the 5½ inches of water 990 degrees.

If we go on a little further, we will find that this heat was diffused throughout 1700 cubic inches of space occupied by steam and here quantity takes the place of intensity each atom of steam requiring its unit of heat to hold it in the gaseous form, for if one atom should lose its required unit of heat, it would be no longer steam, but would become water, and perhaps carry several of the surrounding atoms with it to the liquid form.

If we could compress the 1700 cubic inches of steam into one-half its volume without loss by radiation or condensation, we would find an indicated increase of temperature *of 38 degrees, and it would continue to in*crease as the volume was reduced. Water at the boiling point cannot be made to indicate any higher temperature than 212 degrees. No matter how intense the heat applied, an increase of ebullition is all that is indicated until the body of water is all evaporated. It is during this period that the seemingly lost heat is carried off into the increased space occupied by the steam.

Rumford says that steam contains enough heat to raise ten times its own weight of water 102 degrees, or