FORESTRY, ITS CLIMATIC AND HYGIENIC INFLUENCE.

The following is the conclusion of Mr. M. McQuade's essay :—

THERMAL INFLUENCE OF TREES.

In the former paragraph we considered the use of timber in the collection and condensation of water, and shall now try to show their influence in modifying the heat and cold of the climate. It is one of nature's laws that *when a body passes from a rarer to a denser state, heat is liberated, and from a denser to a rarer, heat is absorbed.* Now, the sun's heat is a very powerful agent in the growth of plants, so much so that without it no vegetable can come to maturity, but experience proves that too much heat will destroy vegetation. Newspapers report that crops have been burned off the ground in several parts of the Western States during the past season. We have had similar experience in Huron County some five years ago, when a hot wave, of some two days' duration, passed over us, at the time when fall wheat was getting in the milky state; the result was that there was no grain formed. In a rich field which had been summer-fallowed from an old common at Exeter, and was some twenty acres in extent, with a crop of straw that should ensure forty bushels to the acre, there was not one grain of wheat. Others, from fifteen acres, got from forty to fifty bushels of chicken feed, while others, who happened to have it on strong clay land, and with timber land on the west side, got somewhat over half a crop. (Our prevailing winds in summer blow from west or south-west). The question is, How did the woods to the windward save the grain? Was it by its shelter or by its evaporation? By both. First, a hot wind moving rapidly will heat and dry more than a slow one, or a calm of the same temperature. Second, the chemical action going on at the surface of the tree tops takes the fierceness out of the sun's rays, which afterwards reached the ground through a stratum of vapour, and on that account the crop was not completely destroyed.

If this paper were intended for scientific rather than agricultural information, we could show how much heat is converted into motion, and therefore rendered insensible by a given quantity of water at, say sixty degrees, passing into vapour and then into its gases; but since the calculation would not be very interesting to farmers, we shall take a familiar illustration. To change water into steam at the least requires 212 degrees; but this is not all. You may confine that steam, and add another equal quantity of heat and the thermometer will indicate no higher temperature. The only difference between steam at the boiling point and steam which has taken the double quantity of heat, is, that that which has absorbed the most heat will have the greatest motion among its particles. We see then that the power of water to neutralize heat is very great, and will increase as the heat is intensified. But we must go a step farther in this direction, and show that the leaves of vegetables are natural laboratories in which, through the agency of heat, an intense degree of cold is generated. Part of the water which flows as sap, by the natural forces, at the surface of the leaf, is decomposed and changed into its elements—oxygen and hydrogen. We have seen that water passing into vapour may neutralize from 450 up to perhaps twice that quantity of heat; but when we come to consider its still greater change to its gases, a very much greater effect will be produced.

If we wish to decompose water by means of heat we must first bring it to steam, then throw that steam against some body that is as hot as iron at a red heat, when the water will pass into its elements. (This is the cause of steam boiler explosions). From these facts we may easily comprehend the wonderful influence of growing timber in the reduction of temperature in our hot spells in summer, when our crops are liable to be roasted before they come to maturity, and pastures are burned brown.

Let us now take a look back, and see how these facts square with our experience from thirty years ago down to the present time. At that time, when little land was cleared, when such a thing as prevailing wind was unknown, when the sun's rays struck directly down on the little clearings and were reflected from the walls of timber both morning and evening, when one would suppose that by the addition of reflected heat the crops should be in more danger—what was the result? Were there any sunstrokes, did our crops wilt prematurely, or pastures get parched? Never. It is true that we then had rather unfriendly showers in haying and harvest; that he who wrought hard, watched the weather signs, and was not afraid to haul in hay or grain all night, would have good flour and fat cattle; but he who took his ease, stuck to the ten or twelve hour system, would have spoiled clover, and see his cakes run out of the pan. Short or parched pastures were unknown in those days. Cattle which could be brought through alive to the first of May would be fit for the butcher on the first of November. Even the after-grass on stubble-fields was so rank as to interfere with fall ploughing. Contrast then and now. Bare, square, open pasture fields, with the colour of the soil shining through, as if fire had passed through them, leaving the stubble of grass as brown points, and the roots like dry stubble. Nothing green, except, perhaps, a few omnipresent perennial thistles; cattle panting with heat, or going in a trot to watering trough; while some unfortunate, ignorant of the thermal influence, or driven by necessity to dangerous exposure, falls a victim to the sun's rays. The verdict charges the calamity to the sun, and some extra religious body may go so far as to charge the Maker of the sun with the damage, when in reality it or He had nothing to do in the matter. The paying price of cordwood, the great demand for salt and flour barrel staves, the wasteful conduct of the farmer and lumberman must shoulder the blame. The time is very near at hand when we shall not be able to find a single tree fit to make a stave in our district—when all the elms over twelve inches in diameter will have vanished from the land. Then, why not spare before all is spent? Save at least the remains of our original forest elms which have not attained maturity; do not cut down a young, healthy, vigorous-growing tree, unless you have more timber than clearing—unless you are prepared to see your grain and grass shortened beyond the point of profitable cultivation.

THE EFFECTS OF GROWING TIMBER IN MODERATING COLD.

Like the raw recruit who blew his fingers to warm them and his soup to cool it, nature uses water as a check to the extremes of cold as well as heat, and has placed a beneficent law which, under proper management, will soften down both ends of the scale. Water increases in its density from its elements down to forty degrees, where further density stops, and from that point it will begin to lose density and be changed into snow or ice. Here we have to begin at the other end of the process, and use the agent that destroyed or stored up heat to give it out again, confirming the philosophic axiom, that nothing can be lost in the world. As we saw before, that when a body passes from a denser to a rarer state cold is produced, so, when it passes from a rarer to a denser, the heat is once more given off. When the sun's rays strike the surface at a small angle, and the mercury drops down to thirty at nights, the vapour in the atmosphere condenses to water, and is further converted into snow or hail. That heat which was used in vapourising the water is again thrown out on the air, to warm the breeze and mak northern lattitudes habitable.

TREES AS SHELTER AND FENCE POSTS.

It will be only a tedious repetition to go further into the climatic influence of woods, and we shall now consider its use as shelter to fields, and the necessity of keeping our fields covered with snow, if possible, during winter. Where our wheat and grass lands can be kept covered during the winter season—which will prevent the surface from freezing and thawing—good results are sure to be obtained; while if left bare the ground will freeze, and by its expansive force break the roots of grain or pull up clover. When a thaw follows the surface shrinks, and sometimes runs, leaving the surface roots exposed, which are dried out and killed by the sun's rays and dry winds—a practical experience of which we had last spring, when the surface roots of the wheat were so dried up that all the side shoots died out, and only about one or two of the centre stalks in each bunch came to maturity. Such a state of things is now with us, which only proves that we must be prepared for new and costly experience, unless we can, in some way, replace the timber that has been taken away.

The kinds of timber to plant can easily be learned by every one, for each soil and climate has some variety peculiar to itself—some sort that would do on one soil and would fail on others The evergreens, pine and spruce family, are best suited as wind-breakers, and some, among which may be mentioned the European larch, very valuable for the durability of its wood. Our own and Norway spruces grow well when properly started. The tamarack grows fast on any soil, but has the disadvantage of shedding the leaf in autumn, and its timber is not durable, besides it is liable to be attacked by borers and killed early. The Austrian pine succeeds very well in heavy or light soil, but, except for variety, must give place to the spruce family. Anyone desirous of planting should consult an experienced nurseryman, who will not only furnish him with the proper stock, but the information concerning his soil and modes of planting. One thing must be borne in mind, that the cone bearing, or resinous trees, must be planted by themselves, for when mixed with those that shed the leaf, such as the hardwoods, or even poplars, neither will succeed. Our own forest timbers, those which grow naturally on the soil, should be preferred for general planting, and may be so placed as to be used as shelter and fence posts. By selecting some of our rapid-growing kinds, such as hard maple for high land, soft maple, black ash, and soft elm for low, heavy land—and planting in close triple rows along boundaries, or dividing fences in such a way that the middle row might, after it had grown sufficiently large, be used to fasten fence wires to, thus securing the double purpose of shade, shelter, and fence. On that side of the farm most exposed to storms it would be advisable to plant the coniferous kinds, which would not only tend to the beauty of the landscape, but protection from storms, and would more effectually secure a covering of snow to the adjoining fields. Unless in cases where there may be a plot of poor land, unprofitable for cultivation, we know of no better place to plant than around fences.

PLANTING.—"Where there is a will there is a way" is as true in this as in any operation; and anyone who is in earnest will find not only the plants, but information and time to put them down. Since failure or success in the first attempt will exercise considerable influence in after operations, it is desirable that ardour should not be damped in such beneficial operations, but that all the elements to secure success be present from the commencement.

In our short, hurried seasons time is a great deal to the farmer, and the labor of planting should not interfere with seeding. Although it will be both cheaper and better to get spruces, larches, and the like, from the nursery; the hardwoods can be got in abundance almost anywhere that old timber has been extensively cut and left commons. There are places in this vicinity where hard and soft maple and all the kindred timber plants can be got of any age, growing in the sunlight, and standing often so thick that a person cannot get between them, from half an inch to an inch through, and from seven to nine feet high, healthy, vigorous and straight. For those who have not much seeding or other work in early spring, the supply can be got in spring and immediately set out; but where it is desirable to set out many at a time, the better plan will be to take a sharp axe and spade and dig up the required number just as the snow is beginning to fall, shake the clay from the roots and dip the roots into a puddle of clay, made to the consistence of thick cream, pile them in your hay rack and take home. Next, select a place in some of your fields where snow will not drift very high, but away from fences, for fear of mice, and plough three furrows, throwing one twice over; lay the trees close in a row with roots against last furrow thrown out; hitch one horse to your plough and throw one furrow back on the roots; then put on your other horse and throw up two deep furrows, level the clay in over the collar and part of the stalk with the shovel, and the fall work is done. The object of the deep furrow is drainage, and should run with the water-shed of the ground. We would also plant with the plough, and, if possible, summer-fallow the ground. Before setting down in spring, all bruised roots should be cut off smooth with a sharp knife, and the head shortened in to correspond with the reduced roots, then dip once more in clay puddle, plant while the ground is in good order, shake the tree to get the fine mould well among the roots, set a little deeper than it stood in the woods, stamp well down, seed with clover, and mulch heavily with sawdust or short straw around each tree and leave the rest to Providence. It will be prudent to bring about two plants to the hundred more than you have spaces for, which can be set in a corner to fill a vacancy in case of accident.

THE PRESERVATION OF OUR ORIGINAL FOREST.

On this topic very little need be said. Like a fish out of water, the few patches of original forest have had their surroundings changed by being exposed to rapid currents of air to which they were not accustomed at birth, or during growth, and therefore their means of feeding have been entirely changed. The result is that those that have advanced towards maturity and attained high heads are dying of starvation, while trees of later growth with low heads drink up all the carbon of the air which circulates among their branches, and leaves the light barren air to rise in mockery around the heads of their hoary parents.

The cause of decay of high-headed trees may be explained in this way: Trees derive nearly all their vegetable food from air. The coat of leaves which annually falls undergoes fermentation. In this process carbon, which forms the more bulky part of wood, is, by the action of oxygen, converted into carbonic acid gas, which is once and a half as heavy as air. This gas, in forest in its pristine state, rose slowly in the calm of the woods till it came within reach of the high-headed trees, where, in the sunlight, they drank it in and flourished. Since plants feed plentifully only in sunlight, the younger trees that were lower and consequently in the shade of the older ones, were enabled to take only a small portion of this vegetable food. On account of their unfavorable stature they struggled with all their strength to get their heads up in the light. In an unbroken forest a breeze is impossible, and the gases rise calmly and slowly to the top of the tallest trees, but the moment that forest becomes reduced to a clump or thin belt, a continual breeze sweeps through, the vegetable gases are hurried along at a low level, and never, in any considerable quantity, reach the high-headed trees. The result is that they are robbed by their more humble and younger neighbours; they soon die at the top, and, unless they can push a few branches lower down, cannot long survive.

The only plan at present apparent is to cut down all timber that shows any symptoms of decay at the top; plant three young trees where one was cut down; fence woodland so that cattle cannot get through it till a new growth of seedling wood has been obtained, and, where the owner can afford the time and outlay, set out a hedge-row of spruce on the side of the prevailing winds.

If we would secure a growth of tall, young, clear wood it must not only be shaded, but sheltered. Our main resource must consist in planting. Although very much more might be said on this point, still what everybody knows is no news.

What our Legislature should do in the way of promoting tree planting is not quite clear. It is evident that the bonus system will not have the desired effect. Would it not be well to make it a statutory obligation on everyone who owns an acre of clear land, in fee simple, to plant or cause to be planted a given number of trees? By this means, everyone who owns cultivable land would be obliged to contribute his proportion to the general good; while by the bonus, or by the voluntary system, some would save their timber and plant more, while a next neighbor, more selfish, would destroy his timber and reap the benefit equally with those who do plant.
