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OBSERVATIONS

ON THE

Barrenness

OF

FRUIT TREES.

OBSERVATIONS
ON THE
Barrenness
OF
FRUIT TREES,
AND THE MEANS OF
PREVENTION AND CURE.

By *P. Lyon* P. LYON.

Colere Deos, Colere Agros.

“ By the sweat of thy brow, shalt thou earn thy food.”

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LONDON

A

TREATISE
ON THE MANAGEMENT
OF
FRUIT TREES.

Colere Deos, Colere Agros.

"By the sweat of thy brow, shalt thou earn thy food."

To the Great Society of the World, the following short Treatise is most respectfully dedicated by their Fellow Member and humble Servant.

Fellow Members,

I thought I could not dedicate this little Work, with more propriety to any, than to you ; seeing it was intended for the benefit and instruction of your society. If I have failed in accomplishing that end, I hope

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you will be candid enough to impute it to error in judgment, and not to any impurity of design. For I assure you, I have no *secret pastes, powders, potions, or plaisters* to sell, for the cure of fruit trees in any disease or malady whatever. I have no darling theory to support; I have no doctrines to elucidate, by *Phlogiston, Hydrogen, Carbon, Hydroguret*, or any word ancient or modern, but what can be as well explained by *Chrononhotonthologus*, or any other word you please. I have made no experiments for the purpose of discovery; I have only attempted to follow an universal law of nature, and I was certain if I did not mistake her path, she would not lead me wrong.

Self-interest and the prejudices of education, have ever been the banes of improve-

ment in useful knowledge, in every department of life ; and horticulture has not escaped the influence. One man has trees ; another has pastes, powders, potions, and plaisters to sell ; a third has been bred a gardener, and must adhere to the practice he has been taught, though that should be contrary to every rule and law of nature, reason, and common sense. And it requires more than ordinary courage to differ from a common received opinion ; because a man's character, (than which, nothing can be dearer to him, both his happiness as a social being, and his bread, if not independent, resting on it) is sure to suffer ; as has happened in the present case ; the author having been stigmatised with the grossest defamation : folly, madness, &c. by professional men, amateurs, connoisseurs, &c. He has, however, had the consolation

of being countenanced by what they are pleased to call ignorant men ; that is, men of judgment, not influenced by any selfish motive, or prejudiced by being bred gardeners, or having learnt from them ; for the ignorance of the one is only natural and open to conviction, whereas that of the other is *taught*, and completely shut to every ray of reason, and defies all the powers of Nature. So, would it be easier to convince ten thousand Indians of truth and common sense, than one fanatic in theology, physic, law, or horticulture.

Nothing can shew the power of the prejudices of education and custom, or what may be called taught or acquired ignorance, over that of natural ignorance, stronger than a practice that prevails among the medical tribe. In rolling up a taper limb, they begin at the

small end, and roll towards the great ; the consequence is, that the bandage will not stay up, but constantly falls down towards the small end ; because the last round of the roller forming a greater circle than the former, slips over it, and so alternately, till the whole falls down : whereas, were they to begin at the great end, the last round of the roller forming a lesser circle than the former, would support it, and so support each other to the end. This is an instance of prejudice, shutting impenetrably the understanding, against the irresistible rays of mathematical demonstration, which the sceptic who doubts his own existence, never doubted.

Nor can such an instance be found among the vulgar and illiterate ; but when we look at their theories, we cannot be surprised at *any* practice. I shall take notice

of only one, the doctrine of inflammation; and I would not have done that, had it not been perfectly analogous to the subject I am about to treat of*, and to show

* Inflammation in the animal body may be defined, an unequal distribution of the blood.

Canker in fruit trees may be defined, an unequal distribution of the sap; but to follow out the analogy would carry us too far from the subject immediately in view. This, however, may perhaps be the subject of future discussion: but every body knows, that there are two ways of making a vessel carry easy, by lessening the contents, and by enlarging the capacity of the vessel.

The first (blood letting) is used as the only one applicable with success, on the animal body; the other (removing the outer bark) on fruit trees; and both

the power of education, which will make men believe *any* thing. It will, no doubt, be thought presumption, to call in question a doctrine which has the law of *prescriptive right* in its favour; and it will be reckoned something worse, to differ in opinion and practice, from what has prevailed since the creation of the world: but we are of opinion that no time can make *right* that which is *wrong*, nor *wrong* that which is *right*.

these operate in the same way: by relaxing the whole fluid system, and so enabling every part to maintain and perform its proper functions, and giving any weakened or injured part, an opportunity of recovering its lost power. For it is easily understood, that while every part performs its functions in due proportion to the whole, no disease will ensue; but if, in any way, the balance is lost, inflammation will take place in the one, and canker in the other.

Inflammation, we are taught, is owing to an increased impetus of the blood, in the vessels of the part inflamed, occasioned by an increased action of the vessels of that part itself, and at the same time, there is an accumulation of the blood in these very vessels in that part. This would appear mysterious to any person who had not studied physic, how there can be an accumulation of blood, where the propelling power is increased: but to medical people it is quite intelligible. We do not know what an engineer would think, but a physician is not obliged to think like an engineer.

We have indeed heard of a wonderful stone in some place of Scotland, which moves by a gentle touch, but if a greater force is applied, it will not budge.

Historians relate this story, but they do not, so far as I know, attempt to account for it ; but they wrote before the invention of *spasm*.

We explain inflammation by *spasm*, which stops the blood in its course, and an increased action of the vessels which pushes it on, and both these are produced by the *vis medicatrix naturae*. This kind of reasoning is not confined to physic alone ; for when men cannot explain any of the phenomena of nature, in one progressive series of cause and effect, they set up two opposite agents, the one to do good, the other to do ill ; and the magic lanthorn is carried over the world,—Pull baker, pull devil ; pull devil, “ pull baker.” Push vessel, hold spasm ; hold spasm, push vessel. The *vis medicatrix naturae* brings on a spasm to remove the

spasm. This is like a man mounting upon a load he is going to lift. That there is a power in nature which tends to correct errors and remove diseases, there is no doubt; but this power never acts in opposition to itself. The spasm or constriction, the dilatation, the accumulation of blood, and the increased impetus, all exist in the same place, at the same time. Perhaps the teachers of this doctrine are of an opinion, which some say is founded on experience, that to make any thing generally believed, it is necessary to make it as absurd as possible, and to dash beyond all human comprehension. For when any thing is simple, men begin to reason, and when they begin to reason, they *may* begin to doubt. Gardeners dung their trees to give them nourishment, and they bend the branches, &c. to deprive them of nourishment, what

they call superfluous sap. Fortunately their practice, like that of physic, is not deduced from the theory; for the very method they take to deprive the branch of sap, gives it more. If any person unprejudiced will think but for a moment, and consider the phenomena of inflammation, the tumefaction, and redness, and the remote causes, burning, beating, bruising, compressing, overstretching, overloading, &c. and also the methods of cure, he will be convinced that the proximate cause is quite the reverse of what is now taught, and that it is a diminished action of the vessels of the part, at least that their action is weaker, in proportion, than the other parts of the sanguiferous system; and from this cause, all the phenomena of inflammation can be explained, in one progressive and connected series of cause and effect, and all the

methods of cure appear consistent, according to the laws of nature, without any of that perplexity and contradiction occasioned by setting up two opposite agents. And any person will be convinced that the power of vessels receiving such injuries, and loaded with such burdens, *cannot* be increased by any means the *vis medicatrix naturae* can adopt, far less by a spasm which adds to their burden.

But nothing, perhaps, has tended more to retard improvements and discoveries, than the invention of words without a meaning : because we are apt to refer any thing we do not understand to these terms, and thus, thinking we understand it, rest satisfied without further investigation.

So, in former times, every thing was re-

ferred to *plastic powers* ; very lately, in our own time, *Phlogiston* explained every phenomenon in nature.

Now Hydrogen, Carbon, Caloric, and their allies, have supplanted *Phlogiston* in all his prerogatives ; who succeeds them we are not yet certain, but it is said there are already strong symptoms of a revolution. The nerves are thrown out like a bait to fishes ; the patient and his friends catch it greedily, and swallowing it like the apple of knowledge, become as wise as the doctor himself. My dear, says the wife, I always told you it was the nerves was the matter with that child, but you never would believe me, now you see the doctor says so too : the husband nods assent, and all are satisfied they understand the disease.

The people never heard of nerves, nor ever dreamed it was a disease, till they were taught by professional men ; now the man who would venture to tell them it was nonsense, would be reckoned mad. So says the *professor* ; the parson says so too ; and who dare speak or think after that ?

You must not take the bark off the trees, the gardener says it will kill them ; they will all be burnt alive by the heat of summer, and starved to death by the cold of winter.

Another great bar to discovery is the vanity and self-conceit of men ; who thinking themselves superior beings, despise nature, and refuse to be taught by her. Anxious to outstrip her, wherever they see an effect, they leave her path, and, always

inclined to the intricate and marvellous, take up some whimsical cause, (such as vermin coming from a foreign land with the east wind, the blossom being all burnt by fire in a cold frosty night, the trees being barren from receiving too much sap, &c.) that strikes their bewildered imagination, and draws into darkness after them, thousands who are too indolent or too pusillanimous to think for themselves.

To look for vermin at home, is below their exalted ideas; and are they to stoop to believe that the sap vessels are contracted to such a degree by cold, that the circulation is entirely stopt, and the young leaves and tender blossom wither and die? If they would take the trouble to look, they would see that it is not the blossom that *first* suffers, in cases of this kind, but the tender stalk on

which it grows, and that the blossom will appear healthy a considerable time after the effect on this is quite visible.

What has led gardeners and connoisseurs to think, that bending the branches gives them less sap, I do not know, as I have little intercourse with them or their writings; perhaps it has been from observing that the middle or main stem of a tree, growing most vertically, grows most luxuriantly; but they seem to have satisfied themselves with the first apparent cause that presented, without reasoning or considering, that the main shoot receives its sap in a direct line, whereas the branches receive theirs laterally. But it is as obvious, that, by whatever power the circulation of the sap is carried on, the bent branches must have, at least, the advantage of gravity in their favour.

Such cases occur in every department of life, which it is unnecessary to take notice of here.

Canker explains every malady of fruit trees, and we are told that May mists are injurious to the fruit. But what wiser or better are we by knowing that May mists are injurious to the fruit, and that canker hurts the trees?

It is certainly true, that moist, calm, cold weather, in the month of May, is unfavourable to the fruit crop: but seeing we cannot alter the weather, we ought to inquire into the way and manner it becomes hurtful, that we may prevent its bad effects, as far as is in human power.

The month of May is the season when the trees are in blossom, which, in moist,

calm, cold weather, does not expand quickly, and fall off as in dry, warm, windy weather, but rather curls together, and forms a receptacle for the *vermin*, which, lodging in it, corrodes, and kills the fruit whilst setting.

The *canker* will be found to be nothing but decayed rotten bark, first occasioned, generally, by the stricture of the bark not allowing a free circulation of the juices, which break out in pear and apple trees, as the gum in the cherry, but not forming by itself a solid substance, like the gum, escapes common observation, at any part weaker by nature or injury, and is afterwards increased by these insects nestling and depositing their ova in it.

The usefulness of fruit for sick and heal-

thy, the scanty portion the country affords, compared with the trees planted, render it a subject worthy of the most serious attention to discover any means to increase the quantity, by making the trees more productive. This is the intention of the following short essay. How far it has answered the purpose, let it speak for itself;

“ For facts are stubborn chields, and downa be denied.”

As I was not bred a gardener, and never read any of their books, it cannot be expected that I can be acquainted with their terms, but I have studied to be as intelligible as I could, in using common language, and language further than being intelligible is not the object of this essay. I have used the words “ outer and inner bark,” because they are common, and generally understood in round terms.

By *outer* bark, then, I mean not only the transverse, but also a part, less or more, of the longitudinal, except that very thin, smooth part next the wood, which remains entire when the trees burst their bark.

Whether the longitudinal is all one bark, or more, I have not made it my study to determine : but a separation or division can very easily be made, and is frequently made by nature. I have, however, to avoid circumlocution, been under the necessity of dividing it into two, which I have distinguished by *inner* and *inmost*.

By *inner* bark I mean less or more of the longitudinal, except the *inmost*, by which I mean that very thin smooth part next the wood, which remains entire when the trees burst their barks, either by nature, or when

assisted by art. This inmost bark appears to be, in some respects, very similar to the periosteum in the animal body, and might not improperly be called the *periligneum*. It resists putrefaction to a high degree, and remains sound long after all the rest of the bark is completely rotten. It possesses a considerable degree of elasticity, which is the cause of its remaining entire when the inner bark rends, and by this quality yields to the circulation of the sap.

By *transverse* bark, I mean that external thin membrane whose fibres run across the tree, by some called *Epidermis*.

When I use the word *peeling*, it is to be understood I mean taking off the outer bark as above defined.

OBSERVATIONS
ON
THE BARRENNESS
OF
FRUIT TREES,
AND THE
MEANS OF PREVENTION AND CURE.

THIS subject, which has attracted so much attention, and undergone so much investigation, seems still involved in great obscurity.

If my observations can throw any light upon it, or tend to lead others to any use-

ful discovery, I shall consider my pains well bestowed, and myself amply rewarded.

The first thing necessary to be done, is to investigate the causes.

The principal of these appear to me to be *Vermin*, *Constriction of the Bark*, and *superabundant Blossom*.

These causes, though they may exist separately, are often combined together, and depend for their continuance and extension on one another.

As the first of these causes, viz. *Vermin*, appears to be the most common and most general, and likewise as the other causes will, in a great measure, be obviated by the

mode of treatment I propose for this, I shall begin with it.

When fruit trees grow old, the outer bark cracks and rends into thousands of fissures and crevices, where the vermin deposit their ova, which, coming to life in the spring, attack and destroy first the blossom and leaves of the small short branches on the trunk, and large branches, and soon extend their depredations over the whole tree.

From this will be seen the reason why fruit trees are so often barren near the trunk, and bear only on the extremities of the branches, and frequently on the upper branches only. For, though the progress of the vermin is very rapid, yet, in fine weather, the fruit on the extremities will get set before they reach it.

From this cause the fruit buds are first destroyed, and from the constriction of the bark, they are seldom or ever replaced, so that almost the whole branch remains ever after barren.

To destroy these vermin, and prevent their depredations, many means have been suggested, such as washing with different liquids. Perhaps a liquid may be found capable of destroying them, and it is not unlikely that plain water may do it ; but of this I have no experience ; I only make the supposition from always finding their ova in parts of the tree most sheltered from the rain, that is, the inclined side of the trunk, and under side of the horizontal and pendent branches. But the difficulty of application seems unsurmountable, as well as the effect uncertain. The ova of these insects

are generally laid so deep and secure in the fissures and crevices, and so completely covered by the bark, that it is impossible to make any liquid reach them.

Smoaking, tying hair-ropes, &c. round the trees, laying certain substances upon the ground, about the root of the tree, are not worth taking notice of.

As the ova of these insects are lodged in the fissures and crevices of the outer bark, the means I propose to destroy them, is to take off the outer bark completely from the trunk and large branches, as far at least, as it is cracked and scaly, by which they will be effectually dislodged, and must inevitably perish when driven from their nidus. At the same time it will relieve the tree from the constriction of the dry and hardened

bark, which injures its health, and renders it more subject to the attack of vermin ; for it is observed that the vermin more readily prey upon the weak and sickly plant, than the more healthy and vigorous : hence it is easy to see how these two causes act together, to the injury of the tree and fruit ; the one rendering them more subject to the attack of the other, which carries them on to total destruction : and it has been observed that the vermin are more destructive in a cold than in a warm season, which has made some imagine it more favourable to their production ; but this is a mistake ; the cold is not directly favourable to the production of vermin, but by causing decay of the vegetable which either produces or fosters them. We see this in all putrifying animal and vegetable substances. If the vermin have penetrated through the inmost

bark, it likewise must be cleared away, and the wood scraped round to the sound inmost bark. To facilitate this operation, the small short branches upon the trunk and large branches ought first to be cut away close to the wood.

It will often happen in young trees, and in older ones where the bark is not cracked by age, that fissures and crevices will be formed by wounds, by stumps of branches decayed or cut off, by the branches rubbing on one another, and perhaps by diseases not well known; one of which, it is not unlikely, is constriction of the bark, for where the outer bark was quite smooth, and apparently sound, I have found the inner and inmost bark diseased. In this case, the diseased part must be entirely cut out, to the wood, and carried round till you come at sound

inmost bark, as in the case of vermin. If the disease penetrate to the wood, and go all round, in the same circle or parallel, that tree or branch has no chance to live, it ought therefore to be cut off. If, however, any part of the wood is fresh, it may be preserved by putting in a piece of fresh bark, from another part of the tree, or from another tree ; or it can be preserved by another substance, such as a piece of linen rag, to conduct the sap till a new bark is generated.

Peeling cannot be of so much service to wall trees, in regard to the vermin, they mostly residing and depositing their ova in the wall, and not in the bark of the tree ; but it is of equal service in regard to the constriction.

The proper season for peeling or taking off the outer bark is winter, or early in spring, when the inmost bark adheres firmly to the wood, and is not easily torn off; though it may be done at any season, but requires more caution and dexterity.

The best instruments for this operation, are a cooper's shave or drawing knife, formed into a triangle (*Fig. 1.*), and a drawing knife somewhat similar to a ferrier's drawing knife, for the clefts, which can be easily made of an old sickle (*Fig. 2.*). Many objections have been made to this practice, because it is new, and in direct opposition to the opinion of professional men, which will be taken notice of afterwards. A special objection has been stated against peeling of cherry trees, "that it will cause them gum;" but this is not found-

ed on either reason or experience. The effect is quite the reverse ; it prevents them gumming, because it removes the constriction, and allows the gum and juices to disperse freely over the tree : whereas, when the tree is bark-bound, the gum and juices cannot disperse over the tree, but must burst out at some wound, crack, or stump of a decayed branch. The peeling of cherry trees, however, requires to be done with a little more caution than that of pear and apple trees ; not to cut too deep, nor too late in the season. On the trunks of old cherry trees the bark is so thick, that it requires little dexterity to avoid danger ; and the younger ones and branches may be relieved by taking off the transverse bark only ; which is not difficult to do, as it is not perfectly transverse, but spiral, and winds off like yarn from a clue ; and the operation may be

begun in October, but not continued beyond December. We see the cherry and other stone fruit, as well as the pear and apple trees, universally burst their bark and throw off the transverse, which they never regain, and that they never bear well till they do so.

Notwithstanding this operation, some vermin may still arise from some part being missed, or they may come from some other quarter, and infest the blossom. In this case I propose sweeping and beating off the blossom, which not only dislodges immense numbers of the vermin, but deprives them of their receptacles.

In beating, the stroke should be sharp, and twice or thrice repeated on the same branch, because the vermin are not easily dislodged.

I have practised this for five successive years, and have always increased it, sweeping and beating ruder and ruder every year; and so far from being deterred on account of knocking off the blossom and young fruit, I have ~~on~~ that very account been encouraged to it, both from the produce, and observing that the trees in general have too much blossom. It is not, however, to be done to every tree at random, for some trees in some seasons do not require it; this seems to depend on the species of the tree, and the time of blossom. If the time of blossom is before or after the season of the vermin, for they too have their season, the fruit may escape; hence it happens, that sometimes the early, sometimes the late, and sometimes the intermediate, is the best crop. The same thing may happen from the weather, but this we cannot remedy,

and it certainly would be improper to sweep a tree of spare blossom, not infested. There is much less danger of destroying the sound fruit by sweeping and beating, than could *a priori* be imagined: the diseased, losing its hold, falls easier to the brush or stroke.

The operation of sweeping and beating should be begun as soon as any symptoms of vermin appear; that is, the curling of the blossom and leaves near the trunk and large branches, and should be continued every day, or every other day, till the fruit is *fairly* set, or the season of the vermin past. I say *fairly* set, because it often happens that the fruit is destroyed, and falls off, after it is apparently set, and thus deceives the husbandman, and blasts his hopes.

With regard to wall trees, they cannot so well be beat, but they can be easily swept. It is not my object to take notice of different kinds of walls, but I believe the best will have crevices, where the vermin deposit ~~their~~ ova; it will therefore be necessary to sweep the wall carefully and completely before the blossom opens; which will in a great measure prevent their depredations. If, notwithstanding, they attack the blossom, it likewise must be swept off. The use of sweeping, so far as relates to the vermin, will in a great measure be superseded by the practice of peeling.

The next cause is constriction of the bark. This appears to be a more frequent disease, and more dangerous than is commonly imagined. It is indicated by the unequal growth of the tree, in all parts, and

most commonly between the stock and graft; by the tree swelling more where the bark has been cut, or torn off by accident; by the canker, indurations, contractions, and rotting of the bark appearing in different parts of the tree; by the bark rending of its own accord; by the inner bark rending after the outer bark has been taken off, frequently in the very instant, and often not stopping at the peeled part, but running a great way above, bursting both inner and outer bark. This completely shows that the disease rests in the outer bark.

In this case a longitudinal incision, or a partial peeling, may prove a cure; but it is more certain and complete to peel all round, from the surface of the earth, or rather a little below it, where the bark is soft and yielding, the whole trunk and larger

branches, as far as the bark will admit of division.

If the bark bound the tree like a hoop or cord, by being fixed only at the two ends, a longitudinal incision would be a complete cure; but as the bark is fixed all round, such a cure must be very incomplete. It may, however, be useful on the branches of wall trees, where the flower buds are thick, and cannot be easily peeled, without destroying these. It may likewise be of considerable service on cherry trees, where the stricture depends chiefly on the transverse bark, which, being more lightly attached to the longitudinal than that of pear and apple trees, when cut, sometimes separates itself all round. This disease, or rather cause of diseases, is of the most serious nature, because it always increases it-

self. The bark, losing its health along with that of the tree, becomes tougher, which makes the stricture still stronger.

It may perhaps be thought necessary I should inform at what age, that is, the earliest period, the trees should be peeled. It is difficult to fix a particular date for different species, varieties, soils, and situations; some species and varieties growing faster than others, and all growing faster or slower, according to the soil and situation. It must therefore be regulated by the symptoms of constriction before mentioned, or as soon as the bark will admit of division. As the tree advances in age, the bark thickens and hardens; the peeling therefore must be carried further up every year.

The practice of grafting shews that a

stricture takes place very early ; for I believe it will seldom succeed where the graft is more than one year old ; and as it is better preventing diseases than curing them, it may be proper to remove the outer bark before any of these symptoms appear ; I have accordingly done so to a number of trees, (pear and apple,) of two years old, which have both produced fruit, and grown well to the wood.

A little time, and further observation, may however determine this question with mathematical accuracy, as far as relates to the different kinds of trees *, but whatever the exact proportion may be, it will be in an in-

* I see no impossibility but soil may be applied to this rule.

verse ratio to the power of the transverse bark; hence the operation will require to be performed much earlier on pear and apple, than on cherry trees.

The last cause I have to take notice of is superabundant blossom. This cause operates in two ways in rendering the tree barren; by affording more receptacles and lodging for the vermin; and by requiring more nourishment than the tree can give, so that the fruit either perishes for want of support, or is destroyed by the increase of the vermin, occasioned by the decay of the blossom. For it is observable, that, in this case, when the fruit sets *unequally*, there is some chance of a tolerable crop; and if this did not often happen, the blossom being generally so abundant, I am of opinion we seldom would have any fruit; but where it

sets equally, there is little or no chance. The reason of this appears to be, that, when some get the start of others, they draw the nourishment to themselves; in consequence the others quickly die, by which more support is given to the living: but when they all partake equally, the whole nourishment is exhausted, and the whole fruit perishes. This may be exemplified by supposing a ship at sea with one hundred men, and one months provisions, but by stress of weather she is driven out of her course, and they find it will be two months before they can reach port. It is clear, that, by throwing fifty men overboard, fifty lives would be saved, because one month's provisions for one hundred men, will serve fifty men two months. In this case it might be reckoned cruel, and the men might be put on short allowance, but we cannot apply this cruelty to trees,

and we do not yet know of any method of putting them on short allowance; and if we did, it is not likely they would thrive; for we find that even other animals cannot suffer equal privations and viscissitudes with man: besides, where is the port ~~they~~ they are to get supply? The tree therefore ought to be relieved early, by destroying a part of the fruit.

As I do not know what this superabundant blossom is owing to, (but it appears to be a very general, if not universal law of nature, to provide for loss. This is observable in the animal world, as well as the vegetable; and though we cannot understand the reason, the fact is certain) so I cannot propose a preventative: but the indications of cure will be, to diminish the quantity of fruit, which may be done by cutting off

a number of the branches, and sweeping off the fruit, when in blossom ; and to increase the quantity of nourishment by peeling ; but this is only limited, and a radical cure still remains a desideratum. I expect, however, that the practice of peeling will soon throw some light on this subject.

There is an objection to the practice of cutting off the branches, though stated here, and common among gardeners, which they say they do because the tree has too much wood ; but I never could learn from them the meaning of this phrase. It is true they say it is because the tree does not bear fruit, but they do not inform us how the quantity of wood should prevent the tree from bearing fruit.

How far this practice has succeeded with

them I know not, nor do I know whether they have made a distinction between trees of a spare and profuse blossom ; but I know that I have a number of trees very thick of wood, which bear very great crops ; but all these have a very spare blossom ; and I likewise know, that it is of advantage to the crop in this climate, where the fruit is so often destroyed by the inclemency of the weather, for a tree to be thick of wood ; for I have often observed the fruit of a thick-wooded tree destroyed on that point of the compass whence the storm proceeded, and preserved on the opposite side, when that of the thin-wooded tree was destroyed altogether.

These observations, without any comment, were given in to the Caledonian Horticultural Society, on the 1st September, 1812,

to be read at their meeting, on the 8th of that month, when the author was present to have given any explanation that might have been required, as far as he was able, and that any of the members of that Society might have an opportunity of seeing the effects of the operation, when the fruit was upon the trees. As that was not done, for reasons best known to themselves, and fearing it might share the same fate if given to any other particular society, he resolved to give it to the world at large, where he still had hopes it had a chance to meet with some more friendly, and, though a *stranger*, might be taken in. But, as in this case, he could not be present with every one into whose hands it might come, it became necessary to enter into some explanation.

As many inquiries are made how I was

led to this practice, I find it necessary to give some account of it.

First of all, then, I was led to it by a saying I had frequently heard, "that May mists were injurious to the fruit." As I never either admit or reject a common opinion without evidence, I set about satisfying myself by observation; when I found it in some measure just. The next thing that occurred to me was, in what manner it became injurious.

Upon examining the blossom, I found a small worm in almost every one, which had not shed off, as in dry windy weather, but had curled together, and formed a nidus for the vermin; not but the vermin settling in the blossom will produce this effect, but

moist weather is certainly more favourable for it.

I next inquired whence the vermin proceeded. By observing that the blossom nearest the trunk and large branches was first attacked, I concluded that the vermin came from the tree itself. I was farther confirmed in this opinion by observing that the old trees were more infested than the young, and that all the trees were first and most infested nearest the root, where the bark was most cracked and rent.

In putting it to the test, I found it put beyond all manner of doubt: for, in performing the operation of peeling, I discovered thousands of the ova of these insects, which, as appears by a microscope, are a

beautiful transparent globe, perhaps the most perfect in nature.

I frequently found the worm which had deposited them along with them, sometimes alive, but oftener dead : and I found them generally so securely lodged under the outer bark, sometimes in the inner and inmost, and even into the wood, that I saw no possible means of destroying them but by taking off the outer bark, and even the inmost, and part of the wood, where they had penetrated so far. The only obstacle that now presented itself was, the danger of killing the tree, and thus rendering the cure worse than the disease. This, however, I considered as nothing but a common prejudice, which required nothing but courage to oppose, because I had every encouragement nature could hold out to me. I had

long observed that the tree was nourished principally by the juices circulating between the bark and wood.

Experiments have been made in different countries to ascertain how trees were nourished and received their increment ; but none of these, so far as I know, were conclusive, or could possibly be so. These experiments were, barking the trees ; by which it was found that the trees all died in three years after. But this, so far from warranting their conclusion, (that the trees are nourished solely from the bark, and received their increment by the periligneum being every year converted into, and consolidated with, the rest of the wood,) that it sets it completely aside ; because, if the trees had been nourished solely by the bark, they could not have lived three years ; and

that they do not receive their increment in the above manner, requires no experiment to determine ; for every body knows that the trees acquire their increment in that season of the year when the periglignum is separated from the wood by the sap. Besides, nothing can be more evident, than that the wood is possessed of sap vessels, or tubes. This can be shown by a very simple experiment : take a piece of a branch, or the like, bark it clean, and put one end into the fire, the tubes or sap vessels being contracted at that end, and the sap rarified by the heat, will be seen to pass off at the other end in the form of steam, or fluid, according to the density of the wood. And there are some, as the cane, which have these tubes so large, that water will readily pass through them. So that, all that their experiments could determine was, that the

bark is necessary to the life and growth of the tree. There can be no doubt, however, that the tree receives its increment chiefly from the juices circulating between the wood and periligneum; for we observe that a new ring or stratum of wood is added every year to the circumference of the old wood: how this is done, is more difficult to understand; but we know that solids are formed from water and the finest fluids, by a deposition of minute particles, as in petrification and ossification, and it is highly probable that the wood is formed in the same manner, the old wood serving as a nucleus.

I had observed the bark crack and rend in a thousand places, which I could not conceive to be any thing but an effort of nature to throw off an incumbrance.

I observed that where she had succeeded, there was a fresh, healthy bark below, and the tree or branch healthy: but where she had failed, the outer bark stuck into the inner like a dry hardened scab in the animal body, till by its pressure it had stopt the circulation, destroyed the inmost bark, and materially injured the health of the tree or branch; and where it went all round, killed it entirely. I had frequently observed a very small portion of the inmost bark, alone, preserve a tree or large branch alive and healthy. I observed that the transverse bark was always, sooner or later, destroyed by nature, and never again replaced.

I had that universal law of nature, that man is to live by industry, “By the sweat of thy brow shalt thou earn thy food,” and I did not conceive that we were to have

fruit without labour, more than any other crop.

By the indications of constriction before-mentioned, I was led to the practice of peeling in general.

Since I commenced this practice, many objections have been made to it by professional men. First, the trees were all to be killed by the cold of winter, "starved to death." Seeing they survived this, they were all to be burnt up with the heat of summer. Finding they withstood this also, they were all to die in three years of a lingering illness. The third year is now arrived, and they are neither dead nor sick, but more healthy than ever, and promised a good crop, which I have no doubt they

would have performed as they had done the two last years bygone, had it not been for the extreme severity of the weather, in the time of blossom and setting. And several trees of great age, with which every means proposed by professional men had been used, but never bore fruit, have, since peeled, produced very good crops. In corroboration of what I here state from my own knowledge, I beg leave to insert a paragraph from a letter I received from a respectable gentleman in the neighbourhood of Glasgow:—

“ MR PATRICK LYON,

LANCEFIELD, near Glasgow, 15th March 1813.

“ Dear Sir, ‘

“ It gives me much pleasure to inform you of an experiment made in imitation of

the one with which I saw you engaged, in December, 1811.

“ When I came home, I caused a cutler make me an instrument similar to the one you shewed me, for barking your trees, and commenced my operations on an old Scotch Carnock, with a very hard and corrugated bark, which regularly produced plenty of blossom, but seldom or ever any fruit. I began among the small branches near the top, and continued working downwards, destroying in my progress many thousands of insects, with their eggs. Most of the professional men blamed me for spoiling a good tree. In spring it produced a profusion of flowers, which they declared useless, and the last it would ever shed. In autumn, however, it yielded as much fine fruit as it could possibly carry. The bark is now in

a healthy and vigorous state, and the tree has every appearance of bearing a large crop this season.

(Signed) "JAMES HARDIE, Jun."

Another argument has been brought forward against the practice of peeling, "that nature would not have given the bark, had it not been for some useful purpose." This is certainly true, when applied to sound inmost bark, because it is so essential that the tree cannot live without it; as the juices which nourish the tree are carried on between it and the wood: but it is difficult to conceive the use of dry hardened scabs: and though the whole bark may be necessary at an early period to carry on the circulation, as it is then very thin and yielding, and cannot much injure the tree by its

stricture ; yet, at a more advanced period, it seems not only unnecessary, but hurtful.

So the food that is necessary for the young animal, is not only unnecessary, but unfit for the old. And it may be observed, that the transverse bark, which is the principal cause of almost all the maladies of fruit trees, is always destroyed by nature, and never replaced.

We do not suppose that nature gives any thing in vain ; but we see, as in the transverse bark, and in the blossom, that when she has served her purpose, she throws them aside ; and when we observe her too weak, or too tardy, it is our duty to assist her. But the vanity of man makes him think that nothing is of use in nature but what is for his own. He fancies the earth was made

for him. The sun and moon were made for him, and the stars are only as so many brass nails to adorn the roof of his carriage. Further, if we are not to venture to take off the bark because nature has given it, we ought not to root out weeds, because nature has given them also ; and why destroy the vermin ? They too are the gift of nature. If we were to follow out this mode of reasoning, where would it lead us ? Nature could have produced crops without weeds, and fruit without trees. She could have produced the fruits of the earth without tilling and sowing : Why not loaves and rolls ready made, and then there would have been no occasion for sowers, reapers, millers, or bakers ? Nay, nature could as easily have made man to live without food : but in that state what he would have been we can have no conception. I can give no other

reason for these productions of nature, than that they are to make man industrious. The *stricture of the outer bark*, however, which gives rise to the greatest part of the labour on fruit trees, can easily be explained, without referring to the final cause.

The outer bark forming a greater circle than the inner, would require to expand faster, but is prevented, being rendered more rigid by exposure to the weather, and is burst by the growth of the tree*. But

* If we were to reason, or rather imagine, like the medical tribe, we would not suppose that the bark was burst by the growth of the tree, but that the *vis medicatrix naturae* brought on a spasm or constriction to remove the constriction.

frequently before the tree can overcome the resistance of the bark, it is materially injured in its health, and when it fails altogether, dies. It may be observed, from the straps on wall trees, that a very slight stricture checks the growth of a tree or branch, and produces canker.

And it may be observed, that fruit trees seldom bear well till they burst the bark, and then they are soon after infested by the vermin ; so that they never are, at best but a few years, in what can be called a good bearing state.

A question has been started, whether the vermin is the cause or effect of the canker ? The vermin certainly is not the general cause of the canker; though I believe they may sometimes produce it topically ; nor is

the canker the exciting, but only the pre-disposing cause of the vermin; as is the rending of the bark, wounds, injuries, &c. and I do not find that these produce even *topical* canker, in a tree not bark-bound. So wounds on the animal body in good habit, heal up without any bad consequence; whilst, on a bad habit, the slightest scratch often becomes serious, and sometimes fatal.

The *stricture of the bark*, however, must be viewed in a very different light; for it is undoubtedly the general cause of the canker, by not allowing the juices to disperse freely over the tree, which bursting out at any weak part, form with the bark, this ragged substance called canker. For we know, that all stagnant animal and vegetable juices, when exposed to the air, are much given to putrefaction, and communi-

cate it to, and promote it in, other bodies. Accordingly, we observe the sap of the tree first breaking out like sweat upon the surface of the bark, soon corroding the outer bark, next communicating the disease to the *periligneum* and the wood.

Sometimes contractions, indurations, and rotting of the bark, are produced without this ragged appearance, which are equally dangerous, as they are effects of the same cause.

And it will be found that the disposition of the trees to canker, is, *ceteris paribus*, in proportion to the transverse strength or power of the bark, *i. e.* the aggregate power of the transverse bark, and the transverse cohesion of the longitudinal, taken together. So the disposition to canker will be,

as the transverse power of the respective barks to the force exerted by the growth of the tree. This force it will be difficult to ascertain; but it cannot be thought irrational to suppose it, under similar circumstances, nearly the same. This seems to be supported by what follows.

The relative powers of the different barks can be ascertained pretty accurately, when it will be found that the trees most given to canker, and those which continue longest in an apparent healthy state, without bearing, have the strongest bark transversely, and that those which have the weakest bark transversely, are the greatest bearers, and least given to canker.

This both accounts for the canker, and
“how full-grown fruit trees, especially

some of the finer sorts of French pears, which, though apparently in a very healthy and luxuriant condition, are yet in a state of almost total barrenness." For the very cause which, at last, destroys them altogether, preserves them longer in this apparent healthy state, viz. the strength and firmer cohesion of the bark, which continues to stretch longer without bursting, and forming residence for the vermin, than those of weaker cohesion; yet they are really and truly bark-bound, which prevents them receiving that nourishment fit for bearing fruit. And it may be observed, that these trees, though they may continue for a number of years in this apparent healthy state, at last break out into one universal canker.

As the stricture of the bark is the cause

of the barrenness and canker of these trees, is it not probable that it is also the cause of their fruit not coming to maturity in this climate? the cold contracting the sap vessels and rendering the bark more rigid. And though we cannot suppose any means can supply the place of climate, yet they may assist, to some degree; hence it is not irrational to conclude, that taking off the outer bark may be a means of maturing these fruits better. I have not had sufficient experience to speak fully on this point; but I certainly had finer fruit of these kinds, than I had been accustomed to see, or that these trees ever produced before they were peeled, and a much greater quantity, though every means hitherto used had been tried; and accordingly we find these trees bear better, and are less given

to canker, upon the wall, than on standards.

I have made a few trials of the relative strength of different barks. For example, the beurré, (yellow) an indifferent pear, but a great bearer, and little given to canker; the French bergamot, a very fine pear, but very shy bearer, frequently continues long in an apparent healthy and luxuriant condition, but almost totally barren. Taking, then, the power of bark of the beurré for 1. that of the French bergamot will be 1.7142 fere, or as 7 to 12, almost a duplicate ratio,

But when the transverse bark, on which the stricture chiefly depends, is taken by itself, the difference will be found still greater: thus, taking the power of the

transverse bark of the beurré for 1. that of the French bergamot will be 2.1666, or as 6 to 13; that of the jargonell will be 2.2, or as 5 to 11; that of the muscat, (a tree very much given to canker,) will be 2.8, or 5 to 14; that of the longueville will be 2.8, or as 5 to 14.

Any person may make as many experiments of this kind as he pleases, but we think these sufficient to establish the general principle. Perhaps some species of trees may be more given to canker, in some soils and situations, and other in others; but this can make no alteration either in the rule or practice; and it is believed that those on which the above experiments were made, are much given to canker and barrenness, in every soil and situation, in this climate. And on several hundred of trees,

of many different kinds, and of all ages, not one bit of canker is to be found, where the outer bark has been taken off, some three years past, some two, and some one.

From these observations, no doubt can remain, that the *stricture of the bark* is the cause of the canker, indurations, contractions, rotting, vermin, &c. The radical cure, therefore, will be, to remove the *stricture*, by taking off the outer bark, which I have found confirmed by experience; and I have found this practice not only answer all the expectations I had formed of it, but far exceed them. I expected to render the tree more healthy, and I expected to increase the quantity of fruit; but experience has shewn, that it will not only increase the quantity, but also improve the quality; that it will renovate the old

trees, and promote the growth of the young; and that it will bring old trees, which before were always barren, and young ones, sooner into a state of bearing. And I have every reason to believe, that it will make the trees bear every year, by converting the wood buds into fruit buds; for almost all those trees which were peeled three years ago, have had two very abundant crops, and promised equally well this year, but were blasted in the blossom, by the severity of the weather; and there were innumerable instances of strong healthy blossom on the wood of last year, upon trees of all ages, and many different species, some of them, notwithstanding the inclemency of the season, bearing fruit. And, however strange it may appear, it is a fact, that I have had instances of these trees bearing fruit on the wood, of the current year, and coming to

maturity, though late in the season, and have of these on their way at present.

When the trees are peeled, they send out numerous young healthy shoots from the trunk and large branches, which will come to bear fruit before the old ones fail*, and thus give a constant supply, without the loss of time, as in the common way of cutting down and grafting:

* *Fig. 3*, a swan egg pear tree, 100 years old, which has been for several years past in a complete state of decay. The young healthy shoots upon the trunk and large branches, as far as peeled, not one of which died in winter; and those of the present year are too numerous to be represented on a superficies. Some of these of the current year measure 3 feet 9 inches in length, and $2\frac{1}{2}$ inches in circumference, and have sent out

whereas unpeeled trees seldom send out young shoots from the trunk and large branches ; and when they do, these seldom come to any perfection, but generally die the first winter ; because, from the *stricture of the bark*, they do not receive the proper nourishment, and are festered at the root, or offset, by the vermin and rotten bark of the trunk or branch from which they grow.

These shoots may be very useful for grafting and budding, as the trees produce them in such abundance, and very strong, and as young shoots are often very difficult to be found on old trees.

branches 1 foot 3 inches long. Most of the trees have nearly the same appearance, and making wood at the extremities of the bearing branches.

Some have imagined, that these shoots from the trunk and large branches of peeled trees, would hurt the growth on the extremities. This at first sight appears a rational supposition, but experience has shewn the reverse ; for these trees which have sent out thousands of these shoots, have grown more on the extremities since, than they had done for many years before.

The reason of this appears to be, that, by removing the stricture of the bark, a freer circulation of the juices is given, to nourish every part ; and accordingly I have found those trees sending out innumerable shoots from the trunk and large branches, growing well at the extremities, and bearing fruit abundantly at the same time.

It is said that all efforts which have

hitherto been made to propagate healthy trees, of those varieties which have long been in cultivation, have been entirely unsuccessful; that the grafts grow well for two or three years, after which they become cankered and mossy.

I have not had time or opportunity to know whether the same consequence will follow the young shoots from the trunk and large branches of peeled trees; but as these shoots are themselves healthy, and the trees from which they are taken rendered healthy by the peeling, it is, I think, highly probable that they will continue to grow healthy when grafted upon new stocks.

If this should succeed, those finer varieties which are said to be wearing out, may be preserved.

If we may be allowed to reason from analogy, we have every reason to believe that the offspring of these trees will be healthy. For we know, that, in the animal system, whilst the parent labours under certain diseases, the offspring will be infected; but after the parent is completely free from the disease, the offspring will be as free as if the parent had never laboured under such disease.

If it is true, which I believe cannot be denied, that the roots of fruit trees are more durable than the trunk and branches, we have every reason to conclude, that the shoots, grafted upon the roots, will be a means of preserving these varieties to a later date than any that has hitherto been adopted, so far as I know. And I see no

reason why they may not be preserved to the end of time, as well as that of animals.

These shoots will be very beneficial in re-thickening old trees, which have become so thin of wood as to afford no protection against the fruit-destroying blasts.

I am aware of an obstacle which will occur to many : that the bark will again thicken, and become rigid, by exposure to the weather ; but this is only the longitudinal, whose cohesion is preserved by the transverse, which, when once destroyed, either by nature or art, is never again replaced : so that the same degree of stricture can never after take place ; nor can the like receptacles be formed for the vermin. The longitudinal bark, when freed of the transverse, always rending freely and open, leaves no cover.

It is not, however, to be imagined that any means can be devised to enable the fruit to resist perfectly every possible attack of the weather, or supply the place of climate; but if any means can be discovered to make it stand the storm better, it is doing something. And if we can render the tree more healthy, the blossom will be stronger, to resist the attack of the vermin; and if one kind of weather is more favourable to vermin than another, we may, therefore, properly say, that these means defend the tree and blossom against the weather. But will not a tree which is strong and healthy resist the *direct* inclemency of the weather better than one which is weak and sickly? which we consider as a predisponent cause. So the cold wax does not yield to the seal, but melted, receives the impression from the slightest touch. Not

that it is to be imagined that we can remove *completely*, all the causes which destroy fruit; and if we could, it is more than probable it would cost us more labour to destroy the superabundant produce, than to moderate the effects of the destroying causes. Besides, it does not appear, though we could remove all these causes completely, either proper or necessary so to do. For, as every part of the creation, from the highest planet to the lowest invisible insect, vegetable and atom, seems dependent on another, it cannot be thought absurd to suppose that nature provides for loss in every individual part to support another. If it were otherwise, that beautiful harmony and connection between the parts which now exists, would be lost. But here we must stop, because we can never trace the chain of cause and effect to the extremity,

either above or below, nor understand the prime and moving cause of all things ; but if we can trace the causes of good and evil, so far as to enable us to promote the effects of the one, and prevent those of the other, we ought to be satisfied. In this view it becomes a necessary law of nature, that one part of the creation should, to a certain extent, destroy another. So, even the vermin may be necessary to destroy, to a certain extent, the produce of fruit trees. But when those become too numerous, and too powerful, it is the business of man to preserve the balance ; and this seems to be all he has to do, and all he can do—to check the operations of nature, when too violent, and to support and assist them when too weak ; and for this purpose nature has endowed him with superior powers. By destruction, it must be understood I

mean only change of form and place ; absolute destruction or annihilation is nonsense. “ *Omnia mutantur, nihil interit.*”

If trees, like animals, exhale any thing ~~by~~ the surface, noxious to themselves, as they certainly inhale something salubrious from the atmosphere, removing the rough, corrugated, dry bark, may be as necessary to their health, in these respects too, as cleanliness is to that of animals.

Quere, May not forest trees be peeled with advantage ? especially the oak, whose bark is so valuable in manufacture, and whose wood, to the wealth and defence of the nation ? but which last is lost, being cruelly cut down for the sake of his bark before he is fit for this service. I had no forest trees to practise upon, but I have as little doubt of the

result, as I had of that of fruit trees, which will be not only to preserve the oak till he is fit for ship-building, but likewise increase the quantity of both wood and bark.

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