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INSTRUCTIONS

TO PREVENT THE

BLIGHT

INCIDENT TO

PEACH, NECTARINE,
AND OTHER FRUIT TREES.

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INSTRUCTIONS

TO PREVENT THE

BLIGHT ON FRUIT TREES.

WHAT is usually termed a blight on fruit trees, denotes any unkindness which appears and proves fatal to the blossom, and sometimes the leaves. It may proceed from various causes. What, by these pages, it is my intention and solicitude to prevent, is occasioned by a small, green animalculæ, chiefly observable on peach and nectarine trees, early in spring, before the trees are fully in leaf. I am well satisfied, the eggs that produce them must be deposited some time in the summer or autumn in the preceding year. The powerful influence of the sun, which, in

the vernal months, promotes vegetation, brings them also into life at the very juncture when the trees are capable of affording them nourishment. It is wonderful to observe their injurious effects on the young shoots, where they principally abound. The sap and nourishment the former would otherwise receive from the tree is so palpably intercepted, that they make little or no progress while these vermin remain. The leaves are not only prevented growing to their usual size, but in general much coiled or curled up, and their shape considerably distorted. These insects may be found of different growths on the under and hollow part of the leaf; here they increase rapidly, and as any new leaf arises within their reach, they extend their empire, by invading it. But they only continue for a time, as the season may chance to suit them. The calmest weather, as has been commonly noticed, seems most fa-

vourable to their continuance, but when it proves dry and warm, they much sooner disappear. This was the case last season.

A tree is often partially affected only, and those branches least affected by them will prosper and make good kind wood, while such as are most infested remain in a very stunted, dwarfish state. The same shoots, however, as soon as they have got rid of the enemy, grow for the most part vigorously beyond the wound made by the blight; but the wood, made during the time the insects are upon it, remains just as before, the joints being scarce a tenth of their proper length: yet this is the part of the shoot most depended upon to bear the succeeding year. From this fact it must appear how very essential it must be, that trees make proper wood in the early part of the season, that it may duly ripen, and be put in proper condition for producing fruit.

I have the authority of Millar to say, "those shoots which are produced after the beginning of June will be crude and pithy; and though they sometimes produce blossoms, yet they will rarely bring fruit: nor are the future branches good which are produced from such wood, the vessels being too large to strain the juices. So that they each admit great quantities of crude nourishment to pass through them."

The opinion of a man so eminent in his profession, I hope, will have due weight, and satisfy my readers of the necessity there is to obtain wood in proper season, or the early part of summer. This, however, cannot certainly be done, if the trees are severely blighted at the very time they should be acquiring a quality so indispensable to their bearing.

How common is it for an owner to fancy himself disappointed, from the appearance of his trees in the time of

bloom. They make a tolerable shew of blossoms; he is, in consequence, anticipating a plentiful crop of fruit; the weather favourable; no pinching frosts to take them off; and, perhaps, his trees carefully matted every night, to preserve them. Notwithstanding all these promising appearances, he perceives his blossoms die untimely away, without setting fruit agreeably to his most sanguine expectations.

I doubt not but many will acknowledge this to be the case. I have been much at a loss how to account for the failure, or in what cause it originated, little suspecting it to be the consequence of last year's blight; perhaps the more so, as the trees had put forth vigorously, though late in the season, or out of due course; which shoots, by the bye, actually require a whole summer's sun to mature them. Admitting, however, a quantity of fruit may be set, is it reasonable to expect it can arrive to any

degree of perfection, while the trees are so much blighted as to have prevented their making proper wood?

My own trees were, in my opinion, a strong confirmation of this fact. Three-fourths of what little fruit I had, which fortunately escaped a few nights severe frost, were found upon those parts where the dressing was applied; and these were much superior to such as grew on the other parts which had been blighted. This circumstance could arise only from a greater degree of health and vigour prevailing in the parts dressed, than such parts as were not.

It is a very common remark, in spring, when apple blossoms, more especially, are much infested with caterpillars, to say they are badly blighted, and many entertain the notion that these blights are brought by cold easterly winds; but, in my opinion, these winds are more likely to destroy than to bring them.

I shall now state what they actually proceed from, without retaining the least doubt in my own mind. Indeed, I think I have full proof that it must be, and really is, from eggs laid the preceding year; and that these eggs continue in a dormant state until the season becomes sufficiently warm to hatch them, and also to produce proper food, congenial to their kinds. We see a particular instance in Nature, pointing out to the parent to deposit their eggs on such trees and plants only as are most suitable for their subsequent existence. To satisfy my readers that this is no mistake, soon after the trees had cast their leaves, I took a branch from one of my apple trees, with a number of blossom buds, and examined it with a microscope. Round every blossom bud I could clearly discern a quantity of eggs, and not one on any other part of the branch. They were all close by the foot, or basis, of the bud,

which made me conclude that the bud had considerably grown since the eggs were laid, or they would otherwise have been deposited nearer the end or centre of the blossom. These caterpillars appear only in the spring, when they soon change into the state of moths, which lay their eggs, and, having performed the office assigned them by Nature, soon die. It struck me, as a curious fact, that none of the eggs could be perceived about any of the leaf buds, but only near the precise spot where the young caterpillar was to find its food. So extremely small must these animalculæ be, when they first obtain life and motion, that, had they but a single inch to travel, they might be lost for want in so long a journey.

I do wish those who peruse this would take the trouble of repeating the experiment, and themselves make the minutest investigation of what is here stated; when I am sure they

will be convinced, from their own observation, I have not imposed upon them.

In a book that I have lately seen, published, I believe, by the Bath Society, there is a letter on this particular subject, where the writer recommends smoking the trees for killing the caterpillar; but which, in my apprehension, will little avail. For I conceive that they soon enter into the heart of the bud after being hatched, where they find a retreat so perfectly secure, as to prevent their annoyance from any smoke. This writer relates a remarkable difference, one season, between his own trees and the trees of another person at some distance. His were nearly destroyed by the caterpillar, while his neighbour's appeared free and very promising. Wishing to comprehend a phenomenon so singular, he applied himself very closely to investigate the fact. He found that, adjoining the garden where the

trees were so prosperous, there was a malt-house, with some other erections, which he suspected were the means of keeping off or destroying the caterpillar. It rather strikes me these works prevented the moth from laying her eggs where she must have been so much annoyed by sulphurous effluvia from the fires, and that she had selected a situation where the air was more pure. And from the observations of this sort, which occurred to me occasionally, I am apt to think the gardens in towns are less infested with these kinds of caterpillars than those in the country. In some seasons I have remarked large crops of apples in confined situations, when perhaps entire orchards, much more exposed, scarcely produced one, and which I attribute to the cause just specified.

From what has been premised, let me flatter myself my friends will agree with me in thinking *prevention*

preferable to a cure; and that the most rational plan is to destroy the eggs, and by that means prevent their vivifying. This can never be done so effectually as when trees are in a state of rest, divested of their foliage. And this operation can then easily take place, without the least injury to the trees. The same which I have found answer completely on peach and nectarine trees, there is not a doubt in my mind, will also prove equally efficacious on all other fruit trees, subject to similar injury in the spring. This expedient may probably be deemed very simple; but, if sufficiently efficacious, that, I think, should recommend it. What I commonly used for this purpose, is known to possess a caustic, burning quality, but which is in no degree hurtful to vegetation. Other specifics may have equal energy, but I much question if the whole materia medica will fur-

nish any thing capable of answering the end more completely.

WINTER DRESSING.

Take quick lime, of the strongest kind that can be obtained, slack it by dipping the lumps in hot water, and as soon as it drops into powder, mix it up with chamber-ley, to the consistence of white-wash. But, as the trees would make a singular and not very agreeable appearance to be dressed all in white, I would have added as much yellow ochre and brown umber, with a little lamp-black, as will bring it nearly to the colour of the bark of the tree. The dressing, by these means, will be hardly perceptible at a little distance. Allowance should likewise be made, in mingling it, for drying lighter. Use it quite fresh while it remains quick, that the caustic quality of the lime may not be lost. I would not advise using it either in severe frost, or when

the weather is wet. No size must be used with it. This, though found necessary in white-washing or colouring, in distempers within doors, it would have a contrary effect exposed to the rain and moisture of the atmosphere. This would cause it to dissolve and wash off. The dressing I have found in general to adhere sufficiently without it. My trees yet retain more or less of the dressing, though dressed nearly eleven months. I believe the lixivium made by soap-boilers might be found very good, but the other sufficiently answers the purpose without it.

For wall trees use a small painting brush. Omit no part of the tree, but pay very particular attention to the last year's wood. Take special care to cover the buds well, the eggs of the insect being always lodged as close by them as possible.

Standards require a brush of greater size, with longer bristles, and closer

set. A handle pretty long will also be found more convenient and efficacious. Begin here at the bottom, and work upwards, to avoid annoyance from the dressing.

The business ought not to be done long before the buds begin to push, lest hasty rains should wash and render it ineffectual. It is certainly more safe for it to remain on the trees, in case any eggs should not be destroyed, though I foresee little danger. But, should it so happen, they will be so fast inclosed in the dressing, that it is very improbable, in their infantile state, they will be able to extricate themselves. This composition has also a tendency to destroy moss on trees; that agreeable effect it appears at least to have produced in my garden.

Vines, peach, nectarines, pears, and apple trees, are all very subject to be infested with what I term a tree bug, from some resemblance these

vermin have to that well-known insect. They adhere tenaciously to the bark, and before they begin to breed, appear quite motionless, and, as far as I could perceive, without any legs. Indeed it seems difficult to distinguish head from tail. As the warm weather comes on, a white substance may be observed, which increases so much in size, that where trees are greatly infested, it may even be seen at a considerable distance. By remaining for any length of time, an innumerable swarm of young will be found, and a few breeders soon overrun a large tree. Independent of the injury they do by destroying the health of the bearers, they give the trees a most disagreeable, diseased, and filthy aspect.

A pear tree of mine was much overrun with these bugs, and all attempts to keep them under proved fruitless, until I had it dressed with this composition, which entirely de-

stroyed them. Not a single vestige of them has been seen since. The tree has now the appearance of being remarkably clean and healthy, and bore a better crop of fruit last year than ever it had done before, though it had repeatedly blown.

About seven years ago, I had a quantity of apple trees from a nursery near London. After they were planted, I observed in the crevices of one of them a white substance. On rubbing it, my fingers seemed bloody, and I found great numbers of animalculæ, but could never discover the parent of the breed. I washed the parts with a strong decoction of tobacco, but, from time to time, found them rather increase than diminish, and I began to apprehend they might spread over the whole garden. By having recourse, however, to a mixture somewhat similar to that I have recommended as a preventive

against blights, I at length subdued them.

Many reasons incline me to suspect that they are very prevalent in the gardens about town. I was in one there last summer, when the owner of it complained of the great injury he had sustained by their depredations among his vines in the house, and also on his apple trees, where I had ocular demonstration that they much abounded. But the free use of this dressing, I am fully persuaded, will utterly extirpate them.

The close attention I have paid to this matter, and the minute inspection I have unremittingly taken of the various appearances of fruit trees, convince me the tribes of hostile insects, which molest them, are far more numerous than is generally imagined. Many of them are imperceptible to the naked eye, and not discernible but through a good microscope. I am also very sure the moss on trees

is quite an asylum for them. Here they harbour and breed unmolested. By scraping off the moss, small fragments may be seen, suspended by threads, too fine to be visible to the nicest eye, which doubtless must be the work of insects. But the dressing, as already stated, bids fair to eradicate the moss, and with it, assuredly, whole tribes of these destructive animalculæ, leaving the bark both sleek and kind.

To destroy the insects and the moss, I have likewise tried the concentrated oil of vitriol, diluted with three or four parts of water, which evidently killed both, and may be innocently enough applied while the trees are at rest. Nor would it, at that season, in the least degree injure the tenderest blossom-buds. I once did imagine it might prove an excellent wash to prevent the smut in wheat, and for two or three years intended to have tried the experiment; with this view I

employed a person to procure me some, which he neglected, and I never brought it to proof. I am lately informed, however, that the experiment has been tried by another, and, according to his account, with the greatest success; of which I have not a doubt, so firmly am I persuaded it would have that effect. His wheat, I think he says, was soaked in it for about twenty hours, which astonished me not a little, as I should have supposed in much less time it would so far have penetrated the grain, as utterly to have destroyed its vegetative quality. But this shews the free use that may be made even of such a corrosive acid. Though I have not brought it to trial in my own practice, I make no doubt but that it would answer perfectly well to dress trees with, for freeing them from the eggs of the caterpillar.

It were unnecessary to caution any against mixing it with the composition I have recommended, as the one

would inevitably neutralize the other, by which the effect of both would be lost. Where the vitriol is used, great care is necessary that none of the sparklings fall on any part of the clothes, as it will not fail to shew where it has fallen by the damage it occasions, as I have myself too often experienced, by using it to other purposes.

I have now given all the information necessary on this part of the subject, and which, if duly attended to, will, I flatter myself, be found perfectly satisfactory. But fruit has many other enemies besides those animalculæ, tree-bugs, or caterpillars, and I hope it will be an acceptable addition to what has been said, to inform my subscribers of the means I have also devised for ridding our fruit of them. These will be found for the most part new, as also the best and most effectual hitherto adopted.

Give me leave only to premise, by supposing a gentleman to have a fine

wall of trees, plentifully hung with peach, nectarine, apricots, cherries, plums, grapes, and pears. He naturally contemplates how amply and luxuriously his table will be supplied with delicious fruits: the season more warm and kindly for maturing them than usual, his hopes may be defeated, notwithstanding, as commonly enough happens, by an abundant year of wasps, which, not content with the refuse of the fruit, chuse for themselves. And it is as natural for them, as for us, to select the best and ripest; and very busy they always are, and industrious, not only on their own account, but to feed and cherish their young. It is wonderful what quantities they devour and carry away: on finding a tree to their liking; they rarely or never quit it while any fruit remains. There is no little danger in attempting to pick the fruit, or to dispossess them of their capture. Their defence is fierce and obstinate;

they even seem to have the means of informing their associates belonging to the same nest, where stores of food are collecting. This fact may be confirmed by a very curious circumstance.

I have been trying for several years to discover what will most effectually destroy them, and preserve the fruit. Apprehending nothing would attract them equal to honey, the summer before last I mixed up a quantity with arsenic, finely powdered: this I placed in walnut-shells of the largest kind, boring a hole through both ends of each, by which I fixed a string, and suspended them against the wall among the vines. It happily preserved my fruit, as both wasps and flies evidently preferred the honey. I was apprehensive, however, it did not destroy them; the arsenic, from its weight, might subside to the bottom, and though they fed freely on the sweets, they omitted the poison.

Hearing of a soluble arsenic, prepared by *Allen and Howard, Plough-Court, Lombard-Street, London*, called arseniat of potash, I obtained a small quantity. I mention where it was procured, as I believe it is to be had in but few places in the country. This I dissolved in the proportion of one of arseniat to eight of water, and mixed it with about an equal weight of honey. I then thought of something that would do better than the walnut-shells, which were the tubes, which grow spontaneous in most hedges; or the most common kind of cane used for fishing rods. These I cut so as to leave a joint at each end, and took out about a third or fourth part of the circumference, from joint to joint, to make a proper opening. These I fixed to the wall in a horizontal direction. If placed between two sprays, they will be sufficiently steady, preserving as much of the round above as below; which, in a great measure, prevents

the rain falling in, and the aperture will be in front. Into each I put about a tea-spoonful of the mixture, taking care that it should run the whole length of the tube, which will easily accommodate a considerable number of wasps and flies. As often as the mixture is devoured, be sure to have it renewed, which will be generally necessary about once a day. The arseniat may be dissolved with the water in any quantity; but, from what I observed, it will not do well mixed with the honey long beforehand. I first applied it to a tree of the Stanwel apricot, which had a fine crop, and was most attacked by the flies, but at that time there was not a wasp to be seen. I observed the flies forsook the fruit to feed upon the honey, and confining some which had partaken of it, I found it destroyed them in the space of two or three hours.

Though there were great plenty of wasps in the spring, I concluded,

or hoped at least, the storms and floods in summer must have drowned, as sometimes happens, their nests; and their uncommon scarcity then led me to fear I should not have a proper opportunity of proving this mixture sufficiently on them; but about the time my sweet water grapes were ripening, many of them reappeared. The wet weather had caused some of my grapes to burst, which, no doubt, diffused the scent of them, and made them the more attractive to the wasps; but, on my placing the tubes there, I had the satisfaction to observe they did not in one instance settle upon the fruit, but fled from one deposit of the mixture, to another, until they had sufficient, when they took themselves clear away, probably, to carry food to their young; and in three or four days they left us entirely. I readily concluded they were all dead, young as well as old, but one happening to

fly into my house, the sash was instantly thrown up, to confine him, and some of the mixture brought, of which he ate heartily. He would then have made his escape, but was prevented, and in about three hours it died.

The quantity of flies destroyed by the same means must have been very great: they ate near a pound of honey, besides the addition; but having no settled home, and not feeding their young like the wasps, the poison could prove destructive only to those which fed on it: but by using the mixture freely, and beginning the use of it early, they may probably be considerably thinned.

There is good reason to conclude, were this plan duly followed up and regularly practised, we should at no time have such swarms of wasps as there are, particularly in some seasons. This is extremely desirable in many respects. Independent of the

havock they make among the fruit, their presence in the garden is highly offensive. Their utter extinction would happily remove the fear of being stung by them. They are, in general, very noxious, and much dreaded, especially by some of our females, for their fierce, vindictive qualities; and surely it is an object of some importance to appease their apprehensions in their agreeable retreats, and free their innocent recreations among the luxuries of cultivated nature, from the intrusion of such troublesome and dangerous guests. We know, in a plentiful year of these vermin, how virulent, teasing, and provoking they every where become. No place, where there is the least crevice for their admission, is inaccessible to them. Not the most private recesses, are altogether, or long, free from their visits. They are no respecters of persons. All, of every class, and the

youngest and tenderest, as least on their guard, are liable to be annoyed by them.

All these inconveniences might readily and effectually be prevented, by fixing some of the tubes, as I have described them, on the outside of the house. While they fared so deliciously there, they would have no inducement to come in; nor would they be likely to pay more than one visit. They will feed upon it with that avidity, that a single dose will undoubtedly prevent their return.

Some may be apprehensive this expedient may have a tendency to draw domestic bees, and of which, should they carry ought to their hives, the consequences might be serious. It would not only destroy these useful, industrious insects, but materially injure the salubrious quality of the honey, and thereby be productive of some mischief.

This idea, indeed, at first occurred to me; but I soon found there was no danger, as, in all my visits, to make observations, I saw not, at any time, one domestic bee about the mixture. But even admitting they were, the quantity of deleterious quality in the mixture would be so disproportionate to the general mass, that no reasonable apprehensions could be entertained on this head.

There could be little danger, were it even used at the time the trees are in bloom; they are so strongly attracted by the fragrance of the flowers, they would scarcely regard that circumstance. This I mean to bring to the test, whenever the season comes round. It is a circumstance greatly to be wished, that the wasps fed on this mixture in the spring. It is a received opinion, and I believe a fact, that each individual nest is begun by a single wasp, consequently, every one poisoned then

would prevent a whole nest or swarm; but from my particular observation, at that critical season, they appear more assiduous in acquiring materials to build with, than in search after food.

There are other insects likewise destructive of fruit. Earwigs are well known to make sad havock, particularly among the peach and nectarines. For many years I have been in the practice of catching great numbers, by fixing an adequate number of tubes among the trees. These were cut so as to have a joint at one end, and a small hole through it. These should be placed in proper time, before the insects have increased much by breeding, as it will prevent them from becoming numerous. The tubes should also be examined twice in a week. My method is to take a jug of hot water, and blow through the tubes into the jug, which kills them in an instant. It is

difficult to dispatch them by treading on them, as many are then so apt to make their escape.

I had a part in a garden, some years ago, where there was a good wall of trees, and one season in particular an abundance of earwigs. By pursuing this method we, at one time, killed near a pint measure of them, and by our attention in the use of such means as we knew, preserved a very fine crop of fruit, which must have been much injured by them, if not wholly lost, but for this expedient.

I have tried the mixture made up for the wasps, but could not perceive they would feed upon it.

Ants are also destructive to fruit. I had a considerable run of them for several years, at one end of my house, and had tried various expedients for their extinction, but all to little or no effect, until I was informed they could not run over a chalk.

line. It then occurred to me, some method might be devised of that kind to entrap them; as their movements were in a horizontal direction. I immediately drew a perpendicular line, and soon found it impede their progress, and that multitudes collected on each side of the line, thronging one another to pass on. The consequence was, that many incessantly fell down, and, by placing two or three small earthen pans, with upright sides, close to the wall, their surface even with the ground, and about half full of water, they fell in. But to prevent their escape by running up the sides of the pans, I put in a quantity, perhaps one-fourth, of the oil of vitriol, which suddenly deprived them of motion. By this means immense quantities were caught; perhaps twenty thousand in the space of three weeks. They dropped in so fast, that it became necessary to scum them off once or

twice a day, as the liquid might have otherwise been rendered ineffectual to the crowds which followed. The chalk line also required to be renewed, as the constant efforts made to pass it must have worn away the chalk.

If earthen pans, with flat sides, could be obtained, they would answer better. In their usual round figure, but a small part can come in contact with the wall, and many of the ants fall on one side. The edges of the pan should also be thin, to fit the closer to the wall. Might they not be made of glass? I intend to prove some of this construction the ensuing season. They need not be large. About four inches over, and three deep, will be a proper size.

I afterwards found it needful to make chalk lines in different places; for the ants, perceiving their way blocked up, endeavoured to find out another. In all such cases, a little at-

tention will readily suggest what is best to be done.

I also tried the ants with the mixture, but did not find them eat much of it. But great numbers may be killed by laying flesh for them. A dead rat, mouse, frog, or toad, would answer very well, laid in walks, and covered with a flower pot, to prevent any thing else carrying it away. Examine it often, and, when covered with ants, dip it in hot water. It may then be laid down again, and may serve several days; but had better be removed at night, because, where the ants are very numerous, it might be nearly destroyed by morning.

Thus, having now mentioned and pointed out the means of destroying most of the enemies to fruit, one more of this hostile tribe now claims our attention. The reader may probably anticipate me, as meaning that little arch, but mischievous bird, the *tom-*

tit. I may possibly be more frequently visited by this kind of assailants than most of my neighbours, my garden being situated in the vicinity of some lofty trees, where they may probably breed. Few sorts of fruit come amiss to them, but they are most partial to cherries and pears. I have an autumn burgamot tree, which bore plentifully last season: but these little busy birds scarce allowed one to come to perfection. And in a garden, a small distance from mine, which contains a great variety of winter pears, they made ruinous work indeed, by picking a small hole near the foot stalk, which caused them to decay. It did not occur to me in time, otherwise, perhaps, they might have been destroyed before all this mischief had been done. They are mighty fond of the seeds of poppy. Many of these grow on and near my premises; as the heads of which get ripe, they are mostly destroyed for

fake of the feed. The method I intend to observe next season, is, as the heads ripen, to make a small opening at the top, and pour into each some of the solution of arseniat, which must so effectually poison this favourite food of theirs, as they cannot well survive. I tried the experiment with three or four that had escaped them, which were pecked in the same manner as the others; and I think there is good reason to conclude it must have proved fatal to such as had fed on the feed.

They may also be caught by common mouse-traps, in winter, baited by a bit of fat. And, surely, every means of destroying them should be adopted, as they do every where such incalculable injury. An idea is entertained, indeed, by many, that these birds are very serviceable, at this season of the year, in devouring such insects as they find on the trees. Possibly they may; but it strikes me

that their use, in this respect, may be overrated. The eggs of caterpillars, formerly described, are much too minute to afford them any food, and far too numerous to allow of any benefit resulting from their labours in picking them up. Were the method stated and recommended in the preceding part of this performance duly practised, we might very well dispense with their assistance, in preventing such blights as are occasioned by caterpillars. The certain mischief they do more than overbalances all the good they can effect. Could they be diverted from the one, who would not readily excuse them the other?

Various expedients have been devised and adopted for ridding our gardens of *mice*. They very often ruin the early crop of pease. I have been in the practice of mixing oatmeal with arsenic, finely powdered, put in a small oyster shell, placed be-

tween two bricks, covered with another, or a tile, to keep it dry. A different plan occurred to me this season. Having soaked a quantity of wheat in the solution of the arseniate of potash, in the proportion of an eighth part of an ounce to about six ounces of water, I let the wheat remain in the solution full twenty-four hours. Some of this, which was laid for them, was taken away the first or second night, and a fresh quantity put in its room: but none of this seems to have been meddled with, as the first had, no doubt, destroyed them. One parcel was within doors, where they had made free to carry off some seed put down to dry. This would probably prove the best means of destroying both rats and mice, in barns and out-houses, taking care to secure it from poultry. Of dogs or cats meddling with it, there could be no danger.

I hope, my friends, the subscribers,

will, by this time, acquit me of withholding such information as appears to me useful and necessary, and which, for the most part, will, I believe, be found entirely new, as well as far exceeding what they were given to expect from the printed advertisement. They will permit me to add my honest persuasion, that the directions, here stated, duly observed and practised, by those concerned in gardening, will have the best effect; and, by preserving much private property, do a great deal of public good.

What now remains, is to suggest some hints, chiefly respecting the management of peach and nectarines. Here the reader must expect but little new matter, as my principal intention is to revive old precepts. These, from long observation, I am too well persuaded, are by no means treated with the consideration they deserve. The trees under notice, by this neglect, are certainly, by very

many, badly managed. There are, in gardening, as in phyfic, too many pretenders; and the care of these trees, like the health of more unfortunate invalids, are often enough committed to the care of those of little or no judgment. They may know how to dig and crop the ground, and yet remain perfectly ignorant of the proper pruning and nursing these delicate trees. Such skill and attention as this business requires, are not to be acquired but by long experience and much correct observation. Peach and nectarine, in particular, bear only on last year's wood. It is necessary, therefore, to forecast and provide, by all possible means, a regular supply of fresh wood, in every part, and such as will be most likely to prove fruitful. The young shoots must not be left too long at the autumn or winter pruning. This advice will be more effectually offered, in the words of Millar, whose authority will, I pre-

sume, have its proper weight. He has given as ample and plain instruction on the subject as can be expected or even desired. He says, "In the beginning of October, when the trees have done shooting, you should prune them; in the doing of which, you must shorten the branches, in proportion to the strength of the tree, which, if strong, may be left eight inches long; but, if weak, should be shortened to four or five: train them horizontally to the wall, so that the middle of the trees may be void of branches;" (he is now, it is to be observed, giving directions respecting the management of young trees;) "for that part of the wall will be easily furnished with wood afterwards; whereas, if the shoots are trained perpendicularly to the wall, those which are the strongest will draw the greatest share of the sap from the roots, and mount upwards, so that the side branches will be deprived of their

nourishment, and grow weaker, until they many times decay; and this is the reason we see so many peach trees with one upright stem in the middle, and the two sides wholly unfurnished with branches; whereby the middle of each tree cannot produce any fruit, that being filled with large wood, which never produces any bearing shoots. Nor can the two sides of the trees be regularly filled with fruitful branches when this defect happens to them; therefore this method should be carefully observed in training up young trees; for, when they are permitted to run into disorder at first, it will be impossible to reduce them into a regular, healthful state afterwards, the wood of these trees being too soft and pithy to admit of being cut down again, as may be practised on many other hardy fruit trees, which will shoot out again; whereas these will gum at the places

where they are wounded, and, in a few years, entirely decay."

I here beg leave to remark, that many trees, which I have observed, through mismanagement, are rendered destitute and incapable of bearing wood, except upon the upper part of the wall. The lower branches, being nothing but naked stems, may be made young trees again, by cutting them down within a foot or eighteen inches of the bottom, taking off the part as smooth as possible, and in a sloping direction, to prevent the wet lodging. Then brush it over with a little boiled linseed oil, which, in a few days, will form a varnish, preserve the wood from decay, and prevent it from gumming. This I would recommend to be applied to all fruit trees, where there may be occasion to take off large branches. The boiled linseed oil I have used, with success, to my vines, having found, when old wood has

been cut out, although in autumn, they have been subject to bleed in the spring. Applying the oil, however, entirely prevented it. Where there may be several naked arms in a peach tree, I would advise to cut down but one at a time, leaving the others to bear, while the one shortened was making young wood to fill up the wall. I also make use of it to any trees which are cankered, observing first to pare it clean out, so as to have live bark all round, which I think of considerable service to its healing and disposing the bark the better to grow over again. Such cankered parts are often, I believe, if not generally, the receptacle for insects, and, I conclude, much increased by them; and, if suffered to remain, will greatly spread. I have compared it to a mortification in the human body. Apple trees, in particular, are very subject to this disease, but much more so in some soils than

in others. But to proceed, after this, I hope not unnecessary, digression.

“ The summer following, when the trees begin to shoot, you should carefully look over them, to rub off all foreright buds, or such as are ill placed, and train those that are designed to remain horizontally to the wall, in due order, as they are produced; for this is the principal season, when you can best order them as you would have them; whereas, if they are neglected until midsummer, as is the too common practice, a great part of the nourishment will be exhausted by foreright shoots and other useless branches, which must be afterwards cut off; and hereby the remaining shoots will be rendered very weak, and perhaps some part of the wall be entirely unfurnished with branches, which might have been easily supplied, in the beginning of May, by stopping some of the stronger shoots in such parts of the tree where

there is necessity of more branches, which would cause each of them to shoot out two or more side branches, below the ends of the shoots, which may be guided into the vacant parts of the tree as they are produced, so that every part may be regularly furnished, which is the greatest beauty and excellency of wall trees: but you should always forbear stopping the shoots in summer, where there is not a necessity for branches to fill the wall; for there cannot be a greater fault committed than that of multiplying the number of shoots, so as to cause a confusion, whereby the branches will be too weak to produce good fruit; besides, when they are laid in too close upon the wall, the air is excluded from the shoots by the great number of leaves, so that they are never duly ripened; and, consequently, what fruit is produced thereon, cannot be so well tasted as those which are produced upon such

trees where the shoots receive all the advantages of sun and air to mature them. Thus, having set down the method of training up young trees, I shall now proceed to their pruning and future management, which, being the same as with full grown trees, will serve for general directions how to manage these sorts of fruit.

“ In the pruning of peach and nectarine trees, (which require the same culture), the two following rules should be strictly observed: viz. First, that every part of the tree be equally furnished with bearing wood; and, secondly, that the branches are not laid in too close to each other, for the reasons before laid down, with some others, which will be hereafter inserted; as to the first, it must be observed that all these trees produce their fruit upon the young wood, either of the preceding year, or, at most, upon the two years shoots; after

which they do not bear; therefore the branches should be pruned so as to cause them to produce new shoots annually, in every part of the tree, which cannot be done in the ordinary method of pruning, where persons neglect their trees at the season when they are most capable of management, which is in May; at which time the luxuriant growth of branches may be checked by pinching, and new shoots produced where they are wanting, by stopping the neighbouring branches; which shoots, being produced at that season, will have time enough to ripen and gain strength before the autumn comes on; whereas (note) all those shoots, which are produced after the beginning of June, will be crude and pithy; and though they may sometimes produce a few blossoms, yet they will rarely bring fruit; nor are the future branches good which are produced from such wood, the vessels being too large to

strain the juices, so that they easily admit great quantities of crude nourishment to pass through them; therefore, those persons who only regard their wall-trees at two different seasons, viz. the winter and midsummer pruning, cannot possibly have them in good order, for when all the branches, which were produced in the spring, are permitted to remain till the middle or latter end of June, (as is the common practice) some of the most vigorous will draw the greatest part of the nourishment from the weaker branches, which, when the strong ones are taken off, will be too weak to bear fruit, and hereby the strength of the trees is exhausted to nourish the useless branches, which are annually cut off again, and thus are too many trees managed; and at the same time complaints made of their luxuriance, because two or three shoots, by drawing in the greatest share of the nourishment, grow

very strong and woody, (whereas, if the nourishment had been equally distributed to a regular quantity of branches, there would be no sign of their too great strength), until, by often cutting off these vigorous branches, the trees are either entirely destroyed, or, at least, rendered so weak, as not to be able to produce fruit; for although, by thus weakening the branches, it is often the means to produce a good number of blossoms, (as may many times be observed also upon autumnal shoots), yet the utmost of their strength is spent in expanding their flowers, so that they rarely produce fruit, and very often the greater part of the branches die soon after, which is supposed to be occasioned by a blight, (as I have elsewhere said,) when, in reality, it is nothing less than the fault of those who have the management of the trees. It is, therefore, of the greatest consequence to wall-trees, especially

of these sorts, to go over them in the month of May, to rub off all irregular shoots, and to train in the branches that are left, in due order, to the wall, that each shoot may have its due advantage of sun and air, both of which are absolutely necessary to ripen and prepare the wood for the next year's bearing; and, by duly observing the trees, at this season, there will not be occasion for so much cutting as is often practised on peach trees, to their great injury; for their wood branches are generally soft, tender, and pithy, which, when greatly wounded, are not healed over again so soon as many other sorts of trees; and the wet, insinuating into the wounded parts, doth often cause the branches to canker and die, which may be entirely avoided by the gentle method of pinching and rubbing off the buds, in the spring season, which never makes any wounds on the tree; and hereby a vast deal of labour is saved; for one

person, who is ready at this business, will go over a great quantity of walling in a day; whereas, if the trees are permitted to grow rude all the spring, they will require six times the labour to reduce them into order; besides, it is a great disadvantage to the fruit, in permitting the branches of the trees to extend from the wall and shade them, and when they have grown under the shelter of these branches and leaves all the spring, until midsummer, then, by pruning off some of these shoots, and nailing the others close to the wall, the fruits are suddenly exposed to the sun and air, whereby they receive a great check, and are not only retarded in their growth, but often rendered ill tasted, and have rough skins. The distance which the branches of these trees should be allowed against the wall, must be proportioned to the size of the fruit, or the length of the leaves; for, if we observe how the branches

of trees are naturally disposed to grow, we shall always find them placed at a greater or less distance, as their leaves are larger or smaller; and there is no surer guide to a curious artist than Nature, from whence a gardener should always be directed, in every part of his profession, since his business is to aid and assist Nature, where she is not capable of bringing her productions to maturity, or where there is room to make considerable improvements by art, which cannot be otherwise effected, than by gently assisting her in her own way.

“ But to return to pruning these trees: the branches being carefully trained in, as before directed, in the spring and summer season, we come now to treat of the winter pruning, which is commonly performed in February or March; but the best season for this work is about Michaelmas, when their leaves begin to fall, which will be early enough for their wounds

to heal before the frost comes on; so that there will be no danger of their being hurt thereby: and the branches of the trees being proportioned to the strength of their roots at that season, all the ascending sap in the spring will be employed to nourish only those useful parts of the branches which are left; whereas, if they are left unpruned till February, the sap in the branches being then in motion, as may be observed by the swelling of the buds, the greatest part of it will be drawn up to the extreme parts of the branches, as must afterwards be cut off; and this may easily be known by observing the strongest shoots at that season, when you will find the extreme buds to swell faster than most of the lower ones; for their being no leaves then upon the branches, to detain the sap to nourish the lower buds, the upper ones will always draw from those below.

“In pruning these trees you should

always observe to cut behind a wood-bud, (which may easily be distinguished from the blossom-buds, that are shorter, rounder, and more turgid than the wood-buds,) for if the shoot have not a leading bud where it is cut, it is very apt to die down to the next leading bud; so that what fruit may be produced above that will come to nothing, there being always a necessity of a leading bud to attract the nourishment; for it is not sufficient that they have a leaf-bud, as some have imagined, since that will attract but a small quantity of nourishment; the great use of leaves being to perspire away such crude juices as are unfit to enter the fruit. The length you should have these branches should be proportioned to the strength of the tree, which, in a healthy, strong one, may be left ten inches, or more; but in a weak one they should not be more than six inches; however, in this you must be

guided by the position of a leading bud, for it is better to leave a shoot three or four inches longer, or to cut it two or three inches shorter, than we would chuse to do, provided there be one of these buds; it being absolutely necessary for the future welfare of the tree. You should also cut out entirely all weak shoots, though they may have many blossom-buds upon them; for these have not strength enough to nourish the fruit, so as to give it a kindly flavour, but they will weaken the tree.

“ In nailing the shoots to the wall, you must be careful to place them at as equal distances as possible, that their leaves, when come out, may have room to grow, without shading the branches too much; and you should never nail them upright, if it can be prevented; for, when they are thus trained, they are very subject to shoot from the uppermost eyes, and the lower part of the shoots will

thereby become naked." He further remarks: "When your fruit is set, and grown to the bigness of a small nut, you should go over the trees and thin them, leaving them at least five or six inches asunder; for when they are permitted to remain in bunches, as they are often produced, the nourishment, which should be employed wholly to the fruits designed to stand, will be equally spent among the whole number, a great part of which must be afterwards pulled off; so that the sooner it is done, the better it will be for the remaining fruit: and if, as it sometimes happens, that a part of those left by any accident should be destroyed, yet the remaining ones will be much the larger, and the trees will gain more strength; for a moderate quantity of fruit is always preferable to a great crop. The fruit, when but few, will be much the larger, better tasted, and the trees in a condition to bear

well the succeeding years; whereas, when they are overcharged with fruit, it is always small, ill tasted, and the trees are generally so much weakened thereby, as not to be in a condition for bearing well for three or four years after: so that, upon the whole, it is much better to have a lesser number of fruit than is commonly esteemed a crop, than to have too many, since the fruit and the trees are benefitted thereby.

“The further management of peach trees, in summer, I have already mentioned, and shall only add a word or two more upon that head in this place:

“1st, That the shoots being regularly trained to the wall, as they are produced, the fruit will always be equally exposed to the sun and air, by which they will be kept in a constant and equal state of growing; whereas, when they are overshadowed by luxuriant branches for some time, and after-

wards exposed to the sun by cutting off those branches, their skins will grow tough, and the fruit will be greatly retarded in its growth.

“2dly, By rubbing off and displacing irregular shoots, as they are produced, there will be no need to use a knife to those trees in summer, which is often what they are greatly injured by; for when there are large wounds made on these trees, especially in summer, it weakens them very much: besides, as I have before said, by doing this early, the sap of the trees is not employed to nourish useless branches.

“3dly, I would advise never to shorten any of the branches in summer, unless it be to procure some side shoots, to fill up a vacancy of the wall; and this should never be done after May, because the shoots produced after that time are never duly ripened, and so are no better than autumnal branches.

“When these rules are duly executed, there will be no occasion to cut off the leaves of the trees to admit the sun to the fruit, which is too often practised; for if we consider, that the leaves are absolutely necessary to cherish the blossom-buds, which are always formed at the foot-stalks of the leaves; so, pulling them off before they have performed their office assigned them by nature, is doing great injury to the trees, therefore I caution every one against that practice.”

My readers will excuse so long a quotation, as it struck me, the sentiments of one so high in reputation, would have much greater weight than my own private opinion, unsupported by his authority. These remarks will undoubtedly be needless to many already well-informed; however, to them they can do no harm, and to others may do some good, numbers of whom, within my

own knowledge, have many trees, and are but little aware of the management they require. These I would advise to make themselves masters of the subject. I can assure them, from some experience, it will afford them much satisfaction. They will then be frequently visiting their trees, and feel both an inclination and an interest in considering, frequently, what is most necessary to be done. Those, more especially, who do not keep a regular gardener, will, by degrees, acquire habits of attention, and, by doing little matters themselves, may be of much use both to their own health and that of their trees. They will also be better qualified to appreciate the competency of the gardener to what he undertakes, and know whether he understands his business, and treats the trees with propriety. There are so many pretenders to the art of managing fruit-trees, that those, who are but little

versed in the matter, are liable to much imposition from a set of men more conceited, perhaps, than any other, and who, as in most other cases, affect the more the less they know. A great many others there also are, who, knowing better than they practise, serve more for the sake, merely, of having always a place to go to, than they can serve well; and are wanted, perhaps, in ten places at the same time; so that some must suffer, and their trees be greatly neglected at the very season they require most attention.

Shoots, in spring, should be nailed in as soon as they have acquired sufficient length, and, as Millar directs, “to rub off all foreright, and such as are ill placed,” and when they throw out long, vigorous, luxuriant shoots, the tops should by no means be suffered to remain, but pinched off, as they must otherwise rob the other parts of the tree. By this seasonable

check, the sap will be immediately diffused, to the general support of the whole; the latter as well as the earlier shoots. These will, in consequence, push out, and frequently produce good bearing wood, happily ripened or prepared for next year. But if due attention be not paid to this, these redundancies will require to be cut at the winter or autumn pruning, after having extremely impoverished the tree during the whole time of its growth.

This I apprehend to be so absolutely indispensable, that I cannot help urging the most unremitting attention to the practice of it. Who can help regretting, on walking in the garden even of the greatest stranger, to see his trees injudiciously treated, as they often are, and perhaps the owner put to as much expence in pruning, &c. &c. as he could have incurred from the best possible management?

Millar says, "The best earth for

peach trees is such that is neither too stiff and moist, nor over dry, but of a middling nature; this should be dug ten inches deep, taking the turf with it, and should be laid in heaps eight or ten months before it is used, during which time it should be often turned, to rot the turf and break the clods, whereby it will be rendered light and easy to work; and about the beginning of September you may carry it into the garden."

He might have recommended this for all kinds of fruit-trees. I know of none but what it would well agree with, but in many situations it is not to be obtained. It is very agreeable to plant a garden where the soil is favourable; but natural advantages of this sort are not always to be found, even in situations otherwise agreeable. Gentlemen are often attached to particular spots, where the soil may be very unfriendly, and unless it be improved, and the quality considerably

changed, there is little probability his wall-trees, especially peach and nectarine, will thrive.—Suppose it not naturally stiff and wet. In this case I would recommend the use of such a compost as would bring it as near to a loam as possible. Nothing will effect this better than the screenings of rubbish from old buildings, and the scrapings of turnpike-roads, mixed in due proportion with the natural soil, which should be dug from the border where the trees are intended to be planted; not less than six or eight feet wide, and two feet or two feet six inches deep, with a pavement of broken brick, lime rubbish, or other hard materials, to prevent the trees from striking down into the under strata.

I believe also, a mixture of rotten tan would be found a good addition, for meliorating stiff soils. The scrapings of hard turnpike-roads, as recently observed, are certainly good;

besides the manure they contain, which is finely pulverized by the friction of the wheels, the grit in it has a great tendency to divide, and render more free and porous, such soils as are naturally too adhesive; and by this means the mixture will the more easily drain off.

A keen gravel is also a very unfriendly soil for these trees. I know nothing more likely to improve it than the scourings of ditches and the cleanings of ponds, mixed with lime, marle, and a quantity of rotten cow-dung. It would be of great use, where clay could be obtained. A mixture of it might be very serviceable, but it should lie long, and be often turned over, that it may be thoroughly incorporated; and where the soil happens to be of either extreme, reason points out that it wants the reverse, to render it nearest a loam.

But let the soil be what it may, I

would recommend it to be dug out of the border assigned for the trees, to the depth I have proposed, and always to provide a pavement at the bottom, for preventing the roots from striking down too deep, and getting beneath the warming influences of the sun; which might occasion them to grow too luxuriant, and prevent their bearing.

Where the soil is unfriendly, the walks also should be dug out of the adjoining border, to the same depth, and filled up with the same compost, giving it time to settle before the gravel be put on. This, I am persuaded, will greatly help the trees, and make them endure much longer, as their roots extend much farther than is generally imagined.

Too many, with a view to obtain an early crop of peas, sow them in the borders. It is surely a bad plan for the trees. Nothing should be planted there that grows high, or has

the least tendency to rob the trees of the nourishment the soil should afford them. I would particularly exclude the whole tribe of cauliflowers, brocoli, or cabbages : they draw powerfully, and must exceedingly impoverish the soil ; more especially, as their roots find their way to a considerable depth. I have traced plants, not arrived to cabbages, about two feet below the surface, through such a hard rock of marle as no tool but a pick-axe was sufficient to penetrate. Early radishes and lettuces may be raised without injury. I have also a plantation of strawberries, which seems hitherto followed by no ill effects ; and the waterings they frequently require in dry weather, I have thought of some service to the trees.

In planting, I would have preserved a distance of fifteen feet between each tree ; and not, as is practised by many, a half standard between them ;

but to make use of the vacancy until the trees grow so as to meet. Vines may readily be raised from cuttings, which should be planted in a sloping direction, the uppermost eye nearly covered with the soil, and placed close to the wall. To keep the earth moist, place a flower-pan, filled with water, and a piece of liss in it, one end hanging over the side, which will cause continual dripping, and greatly promote the growth of the cutting. Could rooted plants, however, be obtained, growing in pots, raised on W. Speechly's plan, they would come into bearing a year or two sooner.

If the cuttings push out more than one shoot, pinch the others off, and nail that one up, that it may not be broken down by the wind. As soon as it has cast its leaves in autumn, cut it down, so as not to leave more than three eyes. It is a folly to force their growing too fast, as, when the tops

overrun the roots, it inevitably prevents their bearing. I would caution every one against planting a rooted vine, except it has been raised in a pot, and can be planted without disturbing the root. I once took some cuttings of one about to be planted, which even came into bearing before the rooted vine.

There are but three sorts of vines which answer well out of doors, or in the open air; the black cluster, the Burgundy or Millar's grape, and for white ones none, in my opinion, exceed the royal muscadine. The *white sweet water* ripens sooner and earlier than these; but I am about to discard them, for two reasons. They are much more tender than any I know, when in bloom; there are few seasons they make perfect branches, and they have so thin a skin, that when nearly ripe they are apt to burst with wet. The *black sweet water* is a good grape, and early ripe, but

I find a poor bearer. The *common muscadine* is much planted, bears plentifully, and often forms large, long branches, but does not ripen equal to the *royal muscadine*. This last has also so thick a pulp, that, if gathered when full ripe, and hung on lines in a dry room, it may be kept some months, and will remain all the time plump and good; which, in my opinion, renders it a valuable sort, and well worth propagating.

The *parsley leaf*, or *Canada grape*, I find a most excellent bearer, and forms noble bunches, but it requires a season uncommonly warm to perfect them. For a particular description, however, of vines and grapes, with the improved method of mixing and managing them, I have great pleasure in referring my readers to W. Speechley's *Treatise on Vines*; being, I believe, the best ever published. If my plan be adopted, of placing vines between the trees, they will, in a good

year, furnish the table plenteously with delicious fruit, for a long time after the peaches and nectarines are over.

Gentlemen, about to erect walls for fruit, had better build them with flues, even though they never should be used. These may be finished at no great expence, and will give them an opportunity of saving their fruit in unfavourable seasons, when their trees are in blossom, and insuring, for a small premium, what no money, on some occasions, can purchase. There is, besides, a real saving in the scheme, which at first sight may seem strange, at least till explained.

Few would think of building a wall less than a brick and a half thick, which admits of flueing, and the saving will be in the extra number of bricks it would certainly require to make it solid. The workmen will build it, as I know it from experience, for the same price as though it were

solid, and plaister the inside of the flues withargeting mortar, which is a quantity of cow-dung tempered up with mortar, to render it tough and prevent its cracking. This should by no means be omitted.

I have not hitherto made use of my flues, but had occasion last season to observe the utility of the plan, in a garden at a small distance from my own, where a few night fires saved an excellent and plentiful crop on a nectarine and two peach trees, while very few escaped on other trees in the same garden. These flues were also made use of two or three years ago, to forward the grapes, as, the season being backward, there was hardly any probability of their ripening; but, by the aid of a little fire, they soon came to great perfection. The berries swelled so much larger than usual, that there was a very considerable increase even in their weight.

It will now, doubtless, be acknowledged, I have considerably exceeded what my printed advertisement promised. I was desirous not to fall short, or give any just occasion to say I had not rendered enough for value received, as I had much rather the obligation lay with the public than with me. I hope, at least, none will tax me with imposition. It is not merely an hypothesis, grounded on prejudice, or false or imperfect information; but experience, founded on well-established facts. But the public have been so often deceived and abused by specious pretences, that they are now become more jealous and fastidious, which has narrowed so extremely my subscription, that I do not expect, from my present apprehension, it will amount even to one-fourth of what it reasonably promised. I am, notwithstanding, just as much obliged and as thankful to those who have done me the fa-

vour to subscribe, as though they had been ten times as numerous as they are; and I have for that reason been the more desirous to compensate them for the confidence they have reposed in me. I have therefore added, to what was specified in my advertisement, an infallible method of preserving fruit from wasps, which will be found as new as it is valuable; and there cannot be a doubt but this plan, duly practised, will entirely prevent these noxious insects from swarming in future, as they some years do. I may, as well as others, be partial, and too highly appreciate my own discoveries; but, considering the great and manifold advantages resulting from them, not only in preserving fruit, but in various other respects, which must have occurred to most readers in the perusal of the foregoing pages, I hope I shall stand excused. However, this information alone deserves ten

times more than the whole is likely to yield me.

The destruction of earwigs, ants, mice, &c. will likewise be found a useful addition. From some of the agents, employed in procuring subscriptions, I am told, that many have acknowledged that the means to prevent blights were much wanting, but the fear of being deceived has deterred them from favouring me with their names. I blame them not, but acknowledge they have had too much reason, from innumerable deceptions daily practised on public credulity, to fear this might turn out as false and delusive as others had done. There is another class, also, perhaps, not quite so honourable, who have held back from subscribing, under the confidence they may yet obtain it by the liberality of their more generous neighbours, who are disposed to encourage such useful discoveries. The majority may never have heard

of or seen any of the advertisements. From these, when my labours are better known, I still hope for an addition to the small number who have already subscribed. But, to such as flatter themselves with the persuasion of receiving all the instructions it holds forth gratis, let me say they certainly do not by me as they would be done by; and I do presume, none of my subscribers will feel themselves at liberty to communicate any part of my work to such as have not thought proper to encourage it. I wish not to withhold it from the public at large, but surely there can be no reason for my not receiving, in the first place, a due consideration for the time and pains the collection of these facts and observations have cost me, in proportion, at least, to the valuable ends they may be found to answer: of which, however, it must be confessed, I have, at present, no expectation.

It has been my endeavour, through-

out, to be sufficiently explicit; but, if in any thing I have failed, and any of my subscribers wish for further elucidation, and will do me the favour of writing to me, post paid, what further information is in my power is very much at their service, and shall be freely communicated.

One disease, incident to trees and plants, has not been mentioned, and which my specific will not prevent; I mean *mildew*. I had no idea, till last summer, that this also is animalculæ. I knew, from dear-bought experience, it was something exceedingly prejudicial wherever it happened to abound; having a large plantation of those kinds of roses used in medicine, and part of them much injured by it. A suspicion, however, occurred to me, that this mischief might be effected by insects. Not being possessed of glasses sufficiently powerful to ascertain the fact, I sent some leaves, much covered with the

mildew, to a friend, in town, who, I knew, had a good microscope, to see what he could find out. His reply was, that he could discover both insects and maggots. *I think he may*

This disease ~~can certainly~~ be cured, and, as I presume, most effectually, by a summer's dressing. Nor does any thing occur to be so likely to prove efficient as a decoction of tobacco. This I mention, as I have seen peach trees infested with it; but it abounds most at the latter end of the season. Many late crops of peas are ruined by it. Some years we hear great complaints of its attacking the wheat, and likewise the hops. Where they hide in winter seems unaccountable; but, minute as they are, I think they must be furnished with wings, for conveying themselves to distant places, and to such plants as suit them best, where they increase wonderfully. Late crops of peas are not so subject to mildew, when

sown on fresh land, or land not cropped with peas before. This is not always practicable; but I throw out the hint, that such, as have the opportunity, may avail themselves of it.

I cannot conclude, without once more reverting to apple trees. Though it may appear a work off too great magnitude to dress the trees of a whole orchard, it would, in my opinion, perfectly repay the expence and trouble. One man would dress a great quantity in a day. Let all who have orchards, only consider the difference between a good crop and a bad one, or none at all.

I have often regretted in observing how much orchards are in general neglected, particularly in this part of the country; how much they are overgrown with moss, and encumbered with a great deal of superfluous wood. I would therefore recommend to the attentive perusal of gentlemen, an ingenious publication, the

Orchardist, by Thomas Skip Bucknall, Esq. M. P. It contains much useful information, which, if duly practised in our orchards, would, in a few years, give them a more respectable appearance, and return the owners much more amply than they do at present. I remain, with due respect,

My Subscribers

Much obliged Friend,

RICHARD BURLINGHAM.

*Rose Hill, near Worcester,
2d Month 9th, 1802.*

ERRATA.

Page 4 line 10 *for each read easily*

24 — 17 *for most read first*

25 — 1 *dele* or hoped at least

34 — 9 *for walks read their runs*

65 — 3 *dele* not

66 — 7 *for the mixture read wet or water*

70 — 10 *for three read few*

— — 21 *for branches read bunches*

72 — 9 *for no great read less.*

AN
APPENDIX
TO THE
TREATISE ON BLIGHTS,
OR
THE GREEN INSECT,

CALLED
THE APHIS;
WITH THE MEANS TO PREVENT IT:

ALSO
A METHOD TO PREVENT OR STOP THE PROGRESS OF THE
MILDEW AND RED SPIDER:

WITH
SOME REMARKS ON THE CAUSES OF THE CANKER ON
APPLE TREES,
AND THE MEANS TO RECOVER THEM:

AND
AN IMPROVED METHOD PROPOSED TO RAISE PINES, MELONS,
AND CUCUMBERS, &c. WITHOUT DUNG, TAN, OR STEAM.

By *RICHARD BURLINGHAM.*

London:

PRINTED BY DARTON AND HARVEY, GRACECHURCH-STREET.

1803.

A P P E N D I X.

I THINK it a debt, due to my friends who subscribed to the "Treatise on Blights," to communicate to them such additional observations as I have been enabled to make during the last season, so remarkable for blight; wherein the green insect, or Aphis, has abounded more than usual, and but few kinds of fruit-trees have escaped them. This, I conclude, was promoted, in a great measure, by the cold weather in the spring checking the due circulation of the sap, which is supposed greatly to encourage their increase. These insects are such enemies to trees and fruit, and so destructive of them, that I am induced to give some extracts on the subject, from a publication by the late Dr. Darwin, which I had not seen till within these few months past. He says—

"The history of the Aphis, Puceron, or Vine Fretter, is so curious; the destruction it commits on the foliage of the peach and nectarine is, in dry summers, so irresistible; and its existence on the trees so extensive, that it demands our particular attention. From the observations of Swammerdam, Bennet, Dr. Richardson, and of other philosophers, this extraordinary insect rises in the spring from eggs, which are said to be attached, by the parent Aphis, to the twigs of trees in the autumn, and are believed not a larva, or caterpillar, but a progeny similar to the parent; every one of which produces, in about ten days, not an egg but another living progeny, to the ninth generation, without being connected amatorially with each other. The ninth generation produces males and females; some of both kinds with wings, and others without them; and this tenth generation from those which were hatched from eggs become amatorially connected, and produce eggs, which are laid on the new twigs of various trees, for the next year's progeny, to be hatched by the vernal sun. *Philos. Transf.* vol. lxi. page 182.

“In this uncommon circumstance the eggs of the Aphis resemble the seeds of plants, which first produce some successive generations of leaf-buds, which are of a viviparous progeny, as mentioned in Sect. ix. 3, 1, of this work.

“Nor is this to be ascribed to what has been termed equivocal generation, or to an impregnation of nine fœtuses inclosed within each other, as some have supposed. But this central production of a viviparous progeny of the Aphis seems to resemble the lateral production of a viviparous progeny from the polypus, which, in time, detach themselves from their parents; so that these Aphises are not, I suppose, to be esteemed fecundated females, but proliferous males, as explained in ZOONOMIA, Vol. i. Sect. 39, *on Generation*.

“This double mode of reproduction, so exactly resembling the buds and seeds of trees, accounts for the wonderful increase of this insect, which, according to Dr. Richardson, consists of ten generations, and of 50 at an average in each generation; so that the sum of 50 multiplied by 50, and that product by 50 nine times, would give the product from one egg only in countless millions; to which must be added the innumerable eggs laid by the tenth generation, for the renovation of their progeny in the ensuing spring.

“Their punctures of the leaves of divers fruit-trees, in the summer, produce a swelling and elevation of the cuticle of the leaf, on its upper side, and a consequent curling of it with its upper surface outwards, which terminates in a destruction of it, to the great injury of the tree, and frequently to the death of it. From Dr. Richardson's account, the Aphises on the rose-tree appeared in February, when the weather happened to be warm, from small, black, oval eggs, which were deposited on the last year's shoots in autumn, and that when the weather became colder great numbers of them perished; by which circumstance the rose-trees are, in some years, almost freed from them.

“They came to their full growth before April, and, after having twice cast off their exuvia, every one of them produced about 50 young ones, all of which came into the world backwards, and adhered some time to the vent of their parent, by their mouths or fore-part,

as shewn, in a magnified state, at Fig. 2, plate 9, and were at length set down on tender shoots of the plants, and came to maturity in about ten days, casting off their coats two, three, or four times. The ninth generation, in October, consisted of males as well as females, which were seen to cohabit; and the eggs produced from their intercourse, he asserts, were deposited, generally, near the new buds, or on other parts of the trees which they possessed. These were at first green, but in a few days became brown, and, by degrees, quite black. They were of a regular oval figure, about a tenth of an inch in length, and about half as broad; and adhered firmly, by means of something glutinous, and resisted the severity of the weather.

“Perhaps those Aphises which were from eggs might eat some part of the peach leaves, during their larva state, if such exists, and occasion them to curl up; while those which were a viviparous progeny might only pierce the sap-vessels or blood-vessels, and thus not apparently injure the leaves; as on nut-trees, where, perhaps, they were not hatched from eggs, but might have come thither in their winged state, and have then produced their innumerable viviparous offspring.—But how can vegetables protect the whole inferior surfaces of their leaves, and of their rising stems, from the innumerable progeny of the destructive Aphis, which penetrates their chyle vessels and their arteries; and which, from their immense numbers, may, in process of time, destroy the vegetable world. Many vegetables have not yet acquired any means of defence, and have therefore the first growth of their foliage much injured, or totally destroyed, by this destructive insect—as the nectarine, and peach, and plum, and cherry trees, in many parts of this country, as is every year seen and lamented.

“Some vegetables have, nevertheless, acquired an armour, which lessens, though it does not totally prevent, the injuries of this animal. This is most conspicuous on the stems and floral leaves of moss-roses, and on the young shoots and leaf-stalks of nut trees. Both these are covered with thick-set bristles, which terminate in globular heads, and not only prevent the Aphises from piercing their vessels so easily, but also

secrete from the gland, with which I suspect them to be terminated, a juice which is inconvenient or deleterious to the insect which touches it.

“The means of destroying an insect so extensively injurious, not only to gardens and hot-houses, but to half the vegetable world, would, indeed, be a valuable discovery. If the eggs exist on the young buds, as Dr. Richardson affirms, some application to these, before hatched, might dissolve their shells; as by very dilute marine acid injected on them, or by some adhesive material, which might inviscate them as soon as they are hatched; whether they appear first in their larva state, like minute caterpillars, or in the form of the parent Aphis: as soap-suds injected on the twigs before the leaves begin to unfold, or, perhaps, by rubbing them with oil or glue, by means of a sponge or a painter's brush; but experiment alone can determine the effects of these applications, both on the insect and on the tree. The most ingenious manner of destroying the Aphis would be effected by the propagation of its greatest enemy, the larva of the aphidivorous fly, of which I have given a print, and which is said, by Raumur, to deposit its eggs where the Aphis abounds; and that, as soon as the larva are produced, they devour hundreds around them, with the necessity of no other movements but by turning to the right or left, arresting the Aphis, and sucking its juices. If these eggs could be collected, and carefully preserved during the winter, and properly disposed on nectarine and peach trees, in the early spring; or protected from injury in hot-houses, it is probable that this plague of the Aphis might be counteracted by the natural means of devouring one insect by another; as the serpent of Moses devoured those of the magicians.

“Mr. Harrocks, of Derby, shewed me this larva of the aphidivorous fly, which I saw devour two or three Aphises; and Mr. Swanwick, of this town, at my request made an accurate drawing of both the larva and fly.

“A few years ago I observed that the blossoms of a quince tree, before they were quite expanded, were perforated by a fly; as the wound could be easily discerned, like that on young nuts, when wounded by

the curculio, and all the blossoms of a large tree were destroyed by a small caterpillar; and in this late summer of 1799, the apple blossoms in this country are much injured by a caterpillar, which eats the seed in the pericarp of each blossom, either before or at the time of its impregnation; the petals of the flower closing again over it and dying. The leaves of many trees are renewed after being totally destroyed in the early part of the season; but, though the leaves are restored after the depredation of this insect, yet there follows an irremediable injury to the fruit."

The Doctor, after mentioning a variety of experiments, which he had directed to be applied to his trees early in the spring, and which were thrice repeated, acknowledges, to his great disappointment, when the leaves appeared, they became affected with the *Aphis* as in former years.

What he relates respecting the larva of the aphidivorous fly, I had an opportunity of observing this summer: the gardener was nailing some cherry trees, and remarked a number of these grubs; on shewing them to me, I concluded that they answered the description the Doctor had given of them, and applying one of them to a leaf where the *Aphises* abounded, could distinctly observe it seizing them, and apparently sucking their juices, as the Doctor had described. Perhaps my readers may smile at his recommending the eggs to be sought after, and preserved to the next season, for the purpose of placing them to be hatched on such trees as are infested with the *Aphises*. He has given us no directions where to find their eggs, or how to discover them from those of other insects; and, were it possible, I do not think it probable, they would be able to destroy one in a thousand; but the Doctor seems fond of theory.

The manner of the *Aphises* breeding I had observed before I saw his publication. Viewing them through a glass on a leaf where there were great numbers, and of different sizes, I could clearly and distinctly see the young before they were disengaged from the parent insect, and just as the Doctor has described. I confess, until then I had entertained the idea they had been

produced from eggs, from which, undoubtedly, the first progeny are.

It affords me satisfaction, that I can, from the experience of another year, again recommend the winter dressing, and be able to point out some further improvements to what I had before advised; and here I am free to acknowledge that I was under a mistake, in concluding it would be time enough to dress the trees when the blossoms were nearly ready to open; I am now convinced it should be applied at an earlier period; and the first time mine was done, was much sooner than in the last year, and I found it more effectual; for, after the buds are increased in size, the interstices between them may afford an asylum for the eggs, and also when the buds are grown large, there is a danger of rubbing them off, which may prevent the dressing from being properly and effectually applied. I am also convinced, it will be found more certain, not only to dress the trees, but to cover the whole of the wall. The first time that my trees were dressed, the wall was done also, and I think it next to impossible, to dress the trees perfectly without covering the wall; for, in endeavouring to avoid colouring the wall, many parts of the trees will escape the dressing. I should have recommended this in the Treatise, but was apprehensive it would have been objected to, as many would dislike the appearance; but, to obviate this, I shall advise the addition of a little yellow ochre to the lime, which will give it the appearance of a stone, and have a neat lively effect; and in the summer, when the trees have obtained their verdure, the contrast will be very agreeable. This work will be best and most expeditiously done by a common whitewasher, with one of their large brushes; a quick workman would be able to go over a great deal of walling in a day, and let me again recommend to use none but good unflaked lime, and to mix up no more than will be used in the course of the day. I am the more particular to revive this, having received a letter lately from a gardener to one of the first noblemen in Britain, who, after passing high encomiums on the Treatise, says, "I washed all my trees with your mixture; those I did

as soon as the lime and water were mixed, killed all the bug or turtle insects, but after it had stood twenty-four hours it did not kill them; from whence conclude our lime is not so strong as yours." He adds, "I was rather sorry I had not an opportunity to try your mixture to kill wasps, as there was not twenty to be seen during the summer months; in the month of May there was the greatest number of breeders that was ever known, but the great rains, and cold summer, destroyed all their nests. If your mixture will kill them, that alone is worth more than the cost of your book, as they are the greatest enemies we have in the fruit season."

When the trees are pruned, I would advise to take off every shred; such as will do again emerge in boiling water, to destroy any eggs or insects that may be lodged in them. As soon as possible after the trees are finished apply the dressing, and by no means defer it longer than the first month, as the buds begin to swell soon after that time, if the weather proves mild and open. From the experiments I have made, I do not find but water will do equally with chamber-ley, if the lime is strong and good, of the consistence of white-wash; and the trees should be carefully examined afterwards, and if any parts are omitted, or not perfectly covered, they should be mended; and I think it would be a surer way, if any appears washed off by hasty rains before the trees come out, to do it again where wanting.

The effects of the blight this summer have been much more injurious to my trees, where the dressing was not applied, than in any former year since they have been planted; it not only took off the fruit, but killed a great deal of the wood. With a view to try the dressing fairly again, I had the reverse side of each tree done to what was washed before, and had, in consequence of the dressing, about forty or fifty dozen more nectarines and peaches than on those other parts of the trees where it was omitted; on one nectarine in particular I counted 188 on the side where the mixture was applied, and only five on the other; which was so grievously blighted as to kill a great part of that side of the tree.

The dressing, from the observation I have made, appears to have a salutary effect on diseased trees. I have

an apple tree, which I raised from the kernel of an American pippin, which grew kindly, and bore fruit in the garden where it was first planted; but, on removing it to its present situation, it became very sickly, the branches cankering and dying every season for eight years past; but, by taking pains to clear it from the moss, paring out the cankers, and afterwards dressing it with the mixture, it has made the kindest shoots this summer it ever has done since growing in its present situation, and I think bids fair to make a healthy thriving tree.

I would again strenuously recommend to divest all fruit trees of moss, as it is a much greater harbour to insects than is generally supposed; and when once they are well cleared, I believe there is little doubt but the mixture will keep them so. I not only applied the mixture to my peach and nectarine, but also to the apple trees, and I think they were the freest from the caterpillar, and bloomed the finest they have ever done, and there was an appearance of the best crop of fruit, until the sharp frost took most of them off; so that I am fully of opinion it would well repay the cost and trouble to do whole orchards with it.

The canker on apple, and some other fruit trees, I am fully convinced, is wholly the work of insects. The parent, I conclude, deposits the eggs on the trunk or branches, and when hatched, the young caterpillar perforates the bark, and after it has got entrance, it affords it food and shelter. This autumn, in paring out some cankers not larger than a sixpence, I found several small grubs, of a reddish colour; and in others, which were larger, both eggs and insects; and while they remain there, the canker is continually increasing. The old varieties seem the most subject to it, the golden pippin and nonpareil in particular; also the autumn burgamot pear. These seem much worn out with age; and it has long been observed, that insects are the most disposed to attack those trees that are the least thriving; in such soils where they grow vigorous they are the freest from it. The under strata of my garden is a hard rocky marle, and I apprehend few soils more unfriendly to apple trees, and in such I have remarked they are the most subject to the canker; but, by taking

due care to pare it out and dressing them, I have very much recovered my trees. I had recommended to apply boiled linseed oil to the part, but, from the observations I have made this season, I have reason to think it obstructs the growth of the young bark, which has induced me to apply a mixture of lime and cow dung, of the consistence of mortar, which I find effectually preserves it from the weather; and where the under strata is supposed to be unkind to trees, I believe it will be found of service to open the ground to the roots, and cut off such as appear to shoot downright; if the trees have a large top, it may be necessary to lessen it, lest they should be so weakened at the root as to be blown down by high winds.

I have now given such further information as I thought necessary respecting the winter dressing, which I believe will be found certain to destroy either eggs or insects that remain on the trees through the winter; but I do not pretend it a specific, to cure or prevent every disease trees are subject to. I know it will not, alone, keep off either the mildew or red spider; but the latter is harmless out of doors, compared to either the Aphis or mildew. Several of my peach trees have been infested with the latter for two or three seasons past, and what is singular, though my wall is planted alternately with a peach and nectarine, not one of the latter, that I have observed, is in the least affected with it; but I believe it is natural to my soil. Late crops of peas are generally destroyed by the mildew. I have a large plantation of roses, one part of them has been so injured by it, that the blossoms have scarcely been worth picking. The spring before the last I had a quantity of lime dug in among them, and this summer they have been the clearest from the mildew, and bloomed finer than in any former year. I have the greatest reason to attribute the improvement to the lime, which has induced me this autumn to put about one bushel and a half, or rather more, to each peach tree infested with the mildew: I have had it turned in a good depth, the whole breadth of the border, and as wide as the trees extend against the wall; concluding their roots spread as far beneath the surface. I would with those, whose trees are infested in like manner, to try the same,

I think I may safely engage it will not injure them, and there is a great probability it will be of service.

The great number of wasps in this part of the country in the autumn, afforded me an opportunity of fully proving the efficacy of the mixture I had recommended to destroy them, which I found to answer the purpose fully: in about two weeks from the time I laid the mixture, few were to be seen about my premises, although they abounded before; and, from the quantity that they eat, an innumerable number must have been killed. I had repeated opportunities to try it with those which flew into the house; such as ate freely, were very soon unable to fly, and dropped down motionless in about half an hour; others that had eaten less survived longer, but it was certainly sure to kill them. In addition to the tubes directed to be used in the Treatise, I placed a number of oyster shells upon the top of the wall, and put in each about half a tea-spoonful of the liquor, sufficient to destroy a considerable number of wasps and flies, which I had occasion to repeat daily; this plan answered well, as the weather proved dry. My reason for not putting more at a time, was, lest hasty rains should wash it away. Some few fed so greedily that they died upon the wall, but most of them flew off with it, I conclude, to feed their young, and I cannot believe one of them made a second visit; which I do not doubt, in a general way, they repeat several times in a day, and, I have reason to think, to the same fruit they had fed upon before. Their sagacity to return where they have met with agreeable food, I believe, may easily be proved by a little attention: put a quantity of honey in a convenient place, and with a camel hair pencil colour them with some vermilion, and repeat this as often as any are feeding; by watching it two or three times a day, I am of the opinion that some would be seen there again.

I find a quarter of an ounce of arseniat of pot-ash sufficient to fix ounces of water, and mixed with equal parts of honey.---I put no more honey to the solution than I expect will be used in a day or two, as I thought it did not keep well if mixed in too large a quantity. It requires some attention, but is not attended with much trouble or loss of time.

I think also, it will be found useful to destroy woodlice, which in some places much abound, and are destructive to fruit, beginning with them when quite small; I have not proved it, but it seems probable they will feed upon it. I throw out the hint for others to try the experiment.

The duke of Devonshire's gardener, at Chatworth, Derbyshire, has communicated to me the method he has adopted to prevent the mildew and red spider, on his peach and nectarine trees in the glass cases, which I doubt not will equally answer to trees in the open air. He says, "I entirely prevented the mildew and red spider last summer, by your mixture and the following: two ounces of soft soap, one ounce of flower of sulphur, and one ounce of common turpentine, to one gallon of boiling (soft) water; it may be put on with flannel gloves, or a small engine, to be applied as soon as the trees begin to fruit, and repeat it two or three times during the early part of the summer; not one of them (*viz.* the peach or nectarine trees) had the least appearance of either mildew or the red spider during the summer; and their wood is well ripened, the blossoms bud bold, and very promising for a crop the next season. I have lived here upwards of forty-three years, and never could stop the mildew before, though I have very much checked it by the application of sulphur, as described in my former letter to you. How far it may answer in the open air I cannot say, but I think it likely, as the soap and turpentine adheres to the wood and leaves. I think the mixture should be put on with flannel gloves, and repeated several times after the trees begin to push, for six or eight weeks."

I have also been assured, by another gardener, that the ants may be either destroyed, or effectually driven away, by watering their runs with chamber-ley. As they are such enemies to fruit, I think they may be prevented by watering the earth close to the walls, and round the but of each standard tree; which, if it does not destroy them, according to his testimony, it will drive them away; and I am certain it will prove of service to the trees rather than an injury, if not put on in too great quantities at a time.

A gentleman of Worcester has improved a method

(recommended about two years since in the Repertory of Arts) for raising melons and cucumbers by means of heated water. This plan having succeeded so well the two last seasons, I will endeavour (having his permission) to describe it. The first trial was made with a melon pit, ten feet long by five wide : a fire place was erected at one end of the frame, over the grate of which was placed a copper boiler, containing about two gallons ; this boiler had a copper pipe brazed or rivetted to its top, and from thence a leaden pipe, three inches in the bore, was soldered ; this pipe, after passing through the frame into the pit one foot, branched off each way, kept at an equal distance from the sides and middle of the pit ; at the opposite end, the pipe was united again in one, at a foot distance from the other end of the frame, and from thence passing through the outside, it communicated with the bottom of a small cistern or reservoir lined with lead, ten inches square, and two feet and a half deep.

This cistern being exposed on the outside of the frame, it is necessary it should be defended from the cold air, it must therefore be inclosed with wood, and have a cover made to fit it close to keep in the heat, and that but little steam may escape. Inch deal is sufficient.

The pipes are laid upon an inclined plane of three inches in ten feet, the highest part next the reservoir, where the water is put in to fill the boiler, and sufficient to leave about the depth of seven or eight inches of water in the reservoir, which will not want replenishing oftener than once a week.

He recommends none but soft water to be used, and puts in a small piece of soap, to prevent the boiler, &c. from furring ; and once in about six weeks to draw off the water and fill it with fresh. He covers his pipes with earth to the depth of about nine to twelve inches ; care should be taken never to suffer the water to get so low in the reservoir as to prevent the pipes from being full, and to keep no more fire than will preserve the water a little below the boiling heat. This year he has had an additional pipe, three quarters of an inch bore, laid in from the lower part of the uppermost cross pipe next the reservoir, which is placed in the bed a little below the other pipes, and communicates at the

further end with the small pipe at the bottom of the boiler, to which a cock is brazed, occasionally to draw off the water. This small pipe he thinks necessary to prevent the concussion there would otherwise be, from the steam meeting cold water, which would endanger the bursting of the pipes, and which has actually been the case in one instance for want of this precaution; as the heated water naturally ascends, and the cold water finds its way down the small lower pipe and enters at the bottom of the boiler. He calculates, that about ten pounds of coal is sufficient to make the water of a proper heat, and when the weather is warm, it will continue so until the next evening; but in the first part of the season it will be found needful to light the fire twice a day. This year he has added another pit on the other side, and finds one fire and boiler properly to heat both. He has a tin cup, about nine inches deep, nearly half filled with water, which he keeps in the pit, the upper part level with the surface, occasionally to prove the warmth of the bed with a thermometer, which he endeavours to keep at about ninety degrees, judging that to be a proper temperature for melons, &c. and that he can better ascertain it by that means than with watch sticks; the hands, from the difference in the weather, and also by exercise, are rendered too uncertain to form a true idea by feeling the sticks. I have, with his directions, made the like experiment in a small grape house, and find it answers well; my pit is near seventeen feet in length, and five wide, and I find I can sufficiently warm it with what I estimate at little or nothing, as it would be thrown away was it not used in this manner. The principal part of what I burn is that which has passed through the ash grate, sifted through a fine riddle, which I had with a view to render the ashes the better manure; conceiving the cinders did more injury than service to the land they were put on. These cinders, although so small, I sometimes find too good when the wind is high, by burning out faster than necessary; to remedy which, I have had recourse to ashes unriddled to mix with them, and these I find sometimes will run to cinders. I have adopted count Rumford's plan of a double door to the house, to keep off the external air from the fire, and a

circular draught plate underneath to regulate, or when necessary, to stop the draught, which I apprehend saves a great deal of fuel; for if the draught remains open after the fire is burnt clear, it will soon be consumed, and when burnt out, cold instead of warm air will draw through the flues, and consequently cool the house.—I would recommend the double doors and circular draught plate as the most economical to all stoves, whether in hot houses, or under furnaces, as well as to cast or wrought iron ovens. In hot houses, where a considerable fire is kept up with a view to force fruit early, if this plan should be adopted to warm the pit, instead of tan, to raise pines, melons, &c. it will be needful to build a stove on purpose for the boiler, which I think may communicate with the flues warmed by the larger fire, which, if applied to heat the water, would make it boil so fast that it could not be kept within the reservoir, (as I find the water will be of the same heat in the latter as in the boiler, although seventeen feet apart,) and would probably heat the earth beyond its due temperature, unless it can be so contrived (which I think it may) to heat the water only when necessary, by means of sliding plates.

I believe this plan may be adopted with the greatest certainty to raise pines, and the bed or pit kept up to any heat required, and in several respects will be found preferable to tan, which much encourages the breed of worms, &c. which on this plan would be entirely, or very much prevented; and the trouble and inconvenience of removing the bark bed done away. But where the pit is wide, it will be found necessary to have pipes in proportion; seven feet, I conclude, would require three; and nine or ten feet four pipes; but the same sized boiler, I expect, would serve all.

I have now made such further communications as I thought would prove useful, and, I trust, interesting to many if properly attended to; and I hope, will be thought fully to compensate for any deficiency in the Treatise; and shall conclude with this caution or remark, that being in possession of the best remedies will not avail, unless put in practice. I remain, with due respect,

Rose Hill, near Worcester,
13th of 12th Month, 1802.

your obliged friend,
RICHARD BURLINGHAM.