1885.

NEW ZEALAND.

JOINT CODLIN-MOTH COMMITTEE

(REPORT OF).

Brought up on Friday, 28th August, 1885, and ordered to be printed.

ORDERS OF REFERENCE.

Extracts from the Journals of the Legislative Council.

THURSDAY, THE 2ND DAY OF JULY, 1885.

Ordered, "That a Select Committee be appointed to consider the present working of 'The Codlin Moth Act, 1884,' and to make suggestions on the various blights to which the fruits in the colony are subject, with power to call for persons and papers, and to confer with any Committee appointed by the House of Representatives for a similar object, to report within three weeks, the Committee to consist of the Hon. Captain Fraser, the Hon. Mr. Holmes, the Hon. Mr. Mantell, the Hon. Mr. Menzies, the Hon. Mr. Miller, the Hon. Dr. Pollen, the Hon. Mr. Williams, the Hon. Mr. Barnicoat, and the mover."—(*Hon. Captain Baillie.*)

THURSDAY, THE 23RD DAY OF JULY, 1885.

Ordered, "That the time for bringing up the report of the Codlin-Moth and Blights Committee be extended for three weeks."—(*Hon. Captain Baillie.*)

FRIDAY, THE 21ST DAY OF AUGUST, 1885.

Ordered, "That the time for bringing up the report of the Codlin-Moth and Blights Committee be further extended for ten days."—(*Hon. Captain Baillie.*)

Extracts from the Journals of the House of Representatives.

THURSDAY, THE 25TH DAY OF JUNE, 1885.

Ordered, "That a Select Committee be appointed to consider and make suggestions for the proper working of 'The Codlin-Moth Act, 1884,' with the object of checking the spread of this terrible pest. The Committee to consist of Mr. Levestam, Mr. Hursthouse, Mr. Peacock, Mr. Bruce, Mr. Moss, and the mover; with power to call for persons and papers, three to be a quorum; to report in three weeks."—(*Mr. Hobbs.*)

TUESDAY, THE 25TH DAY OF AUGUST, 1885.

Ordered, "That the Codlin-Moth Committee have leave to postpone bringing up their report for one week."—(*Mr. Hobbs.*)

APPOINTED originally to inquire into the best means of remedying the mischief done by the codlin-moth, the Committee's investigations have taken a much wider range, and cannot fail to be of interest to all fruit-growers. Their report is, however, to be regarded merely as preliminary to the more complete investigation which it recommends. A large amount of valuable evidence is appended, and a perusal of this evidence will give valuable information respecting the best-known remedies for many fruit-destroying insects in addition to the codlin-moth, to which its attention was in the first instance directed. It will show that, with intelligent care and attention, the cultivation of fruit-trees may become, despite the attacks of all insects, a source of wealth to the colony, and a profitable employment for large numbers of its people.

REPORT.

YOUR Committee have the honour to report that they have collected a large amount of valuable information respecting this and other insect pests, and the remedies to be employed in keeping them within check in the orchards throughout the colony.

They recommend that this information should be published by the Government, and circulated as widely as possible without delay.

They would, however, impress upon the Government the futility of any efforts made by fruit-growers to rid the colony of these insects if persons outside the colony are allowed to send into all our ports fruit which is infected.

They therefore recommend that a regulation by Order in Council, under the Codlin-Moth Act, be issued, prohibiting the importation of infected fruit, and making the penalty for any breach of the law confiscation of the fruit, and a heavy fine in addition.

The Committee are also of opinion that the Customs officers or the Sheep Inspectors in the various ports and parts of the colony might be made available for carrying out the provisions of the Act, and for giving effect to the suggestions above made, without much additional expense to the colony.

The Committee find that Mr. Maskell, Registrar of the New Zealand University, has devoted a great deal of time and trouble to collecting information about the various insect pests which do so much damage in the colony, and that he would be willing to undertake the compilation of a full report, if the Government would provide the necessary illustrations and pay the expense of printing and publishing. They consider that such a report, in a concise form, and sold at a low price to secure its wide distribution, would be of great value, and they recommend it to the consideration of the Government accordingly.

28th August, 1885. Hon. Captain Baillie, Chairman.

APPENDIX.

Evidence of T. Kirk, F.L.S.

For the information of the Committee I should state that when engaged in reporting on native forests in March last, I received instructions from the Minister of Lands to report on the various fruit-blights, and the best means of preventing their ravages. In compliance with these instructions I have collected information on the chief diseases of fruit-trees, and, pending the completion of my inquiries, am now engaged in the preparation of an interim report, which will embody the results already obtained. In the meantime I have been directed to attend the Committee and afford any information in my power.

The Codlin-Moth.

This insect is causing a great amount of injury and loss in parts of the Auckland District, in Nelson, Picton, and other places, but at present it is not so common as other troublesome pests. It has been known in Auckland for upwards of twelve years; in Nelson and Picton for fully eight years.

Its life-history may be briefly stated: The moth deposits a single egg on the apex of the ovary when it is beginning to swell; the egg is hatched in a few days, and the caterpillar eats its way towards the central portion of the ovary. It does not pierce the parchment-like covering which immediately protects the immature seeds (pips), but continues its boring until it perforates the outer surface; so that a slightly tortuous gallery is formed, extending from the crown of the young fruit to its base, admitting air freely at first and facilitating the discharge of excreta. The caterpillar now returns to the core, pierces the cartilaginous covering and gains access to the seeds, upon which it feeds until the apple falls, when it leaves the fruit and ascends the trunk, taking shelter in a crevice of the bark, or beneath a tuft of lichen or moss, or immediately below the junction of a branch with the stem, &c. It now enters the chrysalis stage, which, in the early part of the season, is of brief duration, the moth emerging and depositing its egg in the apple as already described; so that two, or possibly three, generations may be developed in one season. Caterpillars leaving the fruit late in the season continue in the dormant stage through the winter, the perfect insect making its appearance the following spring.

The habit of the caterpillar in ascending a tree to pass through the chrysalis stage affords the best opportunity for insuring its destruction. Bands of canvass, calico, or even brown paper from three to five inches wide are fastened round the trunk by means of pins in such a way that the upper margin fits tightly, so that a caterpillar cannot pass between the band and the trunk, while the lower margin is not in absolute contact with the trunk at all points. Instead of seeking the shelter of a bark crevice or tuft of lichen, the caterpillars will take advantage of the bands, which should be detached once or twice a week and the caterpillars destroyed.

To Mr. Hobbs: I should prefer syringing with a weak solution of caustic potash rather than Paris-green for preventing the moth from depositing its eggs.

To Mr. Bruce: The codlin-moth is a serious enemy to the apple-grower, but its ravages may be expected to be less serious in some seasons than in others. I think the danger arising from its wide diffusion is such as to justify the Government in taking steps to prevent the importation of affected fruit; but do not think Mr. Hobbs's suggestion to employ Sheep Inspectors to examine suspected fruit before landing would be attended with success. The subject of fruit-blights is a matter of great importance; I could not say of vital importance.

To the Chairman: The interim report, now in preparation, will contain recommendations with regard to preventive measures.

Scale Blight.

The apple, plum, lemon, &c., are attacked by scale insects of different species. The species infesting the apple is commonly termed the mussel-scale. It is found in all parts of the colony, but is most abundant and injurious in the Districts of Nelson, Marlborough, and Canterbury, where, owing to neglect, it has seriously diminished the annual yield.

In the young state the apple-scale is extremely minute, and possesses active locomotive powers. After a short time it becomes attached to the bark by its suctorial mouth, and secretes a horny case or shell, which not only serves to protect the mother-insect, but answers the purpose of a puparium. The shell is slightly curved, resembling that of a mussel, and is attached to the bark by its sides; the lower portion contains eggs, or young insects in process of development. In old, neglected orchards the trees are often incrusted with myriads of these insects, so that the plant is unable to perfect fruit, or even leaves, although it may maintain a lingering existence for a term of years. Pear-trees are subject to its attacks, and hawthorn hedges often suffer severely.

Not content with attacking the tree, it is frequently parasitic on the fruit. In Canterbury and Nelson I have seen ripe apples clotted over with scale, while not unfrequently a colony may be found nestling in the depression at the base of the fruit.

The apple-scale can be easily destroyed, and the trees kept clean with a small amount of trouble and at a trivial cost. At the School of Agriculture, Lincoln, the double-flowered hawthorns, planted as specimens, had their bark incrusted with scale to such an extent that they were unable to mature their leaves. In this condition they were dressed with castor oil, containing about two ounces of soot to the gallon. The mixture was applied with a paint-brush, and the result was all that could be desired; the scale fell away without scraping, the bark assumed a healthy appearance, and new, healthy leaves were developed within six weeks of the first application. As a measure of precaution, rather than from necessity, a second wash was applied, and the trees have continued in a healthy condition. In planting the experimental orchard, a few young trees, fresh from the nurseries, were observed to be slightly infected with scale and American blight: they were treated the same way with complete success. As there are old trees in the neighbourhood of the school badly infested with scale, I gave instructions for the examination of every tree in the experimental orchard in the late winter or early spring, and the immediate application of a fresh dressing to all trees exhibiting the slightest trace of scale or woolly blight—a measure which effectually prevented either of these pests from becoming established, a matter of great importance in infected districts, as these insects are so easily diffused by birds.

Peach Blight.

To the Hon. the Chairman: My inquiries into the nature and cause of peach-blight were only commenced in April last, so that I have not been able to make myself thoroughly acquainted with the symptoms developed during the spring months.

To the Hon. Mr. Barnicoat: The recommendations I have to make will, I believe, prove sufficient to place peach cultivation in New Zealand on a satisfactory basis.

The disease is more generally developed in the North Island than in the South, and the destructive results have been greater in the northern districts. It has proved most destructive in the central parts of the North Island—the Manawatu District, the country about the head-waters of the Wanganui and Mokau Rivers, &c.—the Taupo country, the Waikato and Thames valleys, and, still further north, in the Kaipara and Hokianga Districts, &c. The peach has died out over hundreds of acres.

The peach is liable to the attacks of several fungi and to various kinds of insects; but although very troublesome, none of these plagues have any direct or necessary connection with the dying out of the peach, now so prevalent. The first symptoms are usually observed after cold winds during the flowering season, and before the full development of the leaves. The ovary swells in the usual way until the young fruit attains the size of a large pea or small horsebean, the trees up to this time presenting a perfectly healthy appearance; but the fruit ceases to increase in size, and falls in a few days; the leaves do not attain their full size, and in a short time they also fall. At or shortly before this time orange-coloured dots or punctures, doubtless of fungoid origin, are found upon the young twigs, and in some cases become confluent, eventually leading to disintegration of the epidermis, followed by an exudation of gum to a greater or less extent; the buds decay, and become infested with thrip or other minute insects. As a general rule the lowest branches are affected before the upper. Sometimes the plant is killed by the first attack; but more frequently towards the autumn new leaves are developed towards the tips of the growing shoots. Although these leaves are almost invariably attacked by a fungus, the plant seems in a fair way for recovery; but in the following spring a renewed attack causes still further exhaustion, and the death of the tree is only a question of time.

To the Hon. the Chairman: The disease is manifested equally in exposed and in sheltered situations.

To Mr. Hobbs: There are apparent exceptions, but in every case that has come under my notice the supposed exception has been found capable of explanation.

To the Hon. the Chairman: The disease is not caused by unfavourable climatal conditions; at any rate, they can only be considered as one factor, and not the most important.

All the symptoms enumerated afford evidence of a low state of vitality. The nutritive processes are not properly performed, so that the plant is unable to resist sudden changes of temperature, especially during the flowering season, when the strain upon its energies is greatest; it becomes more liable to the attacks of fungi and insects, and has less power to withstand them.

The result has been brought about mainly by growing peach-trees on their own roots, and is to be seen in all countries where such a course has been followed. In this colony nearly all peaches are either of seedling origin or are worked on peach stocks. The first step will be the adoption of a suitable stock. This is found in the mussel-plum, the stock invariably adopted by English nurserymen. I do not hesitate to assert that the adoption of the mussel-plum as a stock would place the cultivation of the peach on a satisfactory basis in New Zealand. It would become more hardy and better able to resist adverse influences, while its productive powers could be increased rather than diminished.

To Mr. Hobbs: I have seen two young trees worked on mussel-stocks in the colony. They were growing in an Auckland nursery, and were the only trees that had escaped infection. Even plants from six to twelve inches high, still in the seed-bed, were attacked.

To the Hon. the Chairman: Affected peaches headed down and worked with certain plums appear to flourish. It is, however, by no means certain that the influence thus exerted by the scion upon the stock will prove permanent.

To the Hon. Mr. Miller: The first instance of peach-blight observed by me was in Palliser Bay, about seven years ago. Since that time it has become general in the North Island. I believe it was first observed in the Waikato about twelve years ago.

To the Hon. the Chairman: I am not aware that it is "world-wide," but know that it is general in Australia and America, where the peach has been grown on its own roots as with us.

To the Hon. Mr. Barnicoat: I consider it desirable that new stocks should be worked with buds taken from non-infected trees. The best course would be to allow the trees in the colony to die out, or even to destroy them, and import plants worked on mussel-stocks from England.

To Mr. Hobbs: I do not think there is any necessity for the Government to import trees worked on the mussel-stock. The local nurserymen would import stock of this kind whenever it is demanded by their customers.

To the Hon. the Chairman: I should import what are known in the trade as "maidens;" that is, trees of one year's growth from the bud. They would be purchased wholesale in England at £5 per 100. They might be headed down to save space, and packed in Wardian cases, or even in barrels with chopped sphagnum, cocoanut refuse, or with soil. Mussel-stocks ought to be imported also; probably they would not cost more than from £5 to £8 per 1,000, and would pack in small space.

To the Hon Mr. Miller: The English exporter might ship as early as the commencement of October.

To Mr. Hobbs: I consider that all imported fruit-trees should be examined before landing, especially trees imported from America.

To the Hon. Mr. Miller: Repeated attacks of any kind of blight will eventually exhaust a fruit-tree. Mr. Hobbs has touched the right point in advising the more general adoption of preventive measures—attacking blights of whatever nature on their first appearance. It is comparatively easy to prevent blights from becoming established; it is difficult and costly to eradicate them when they have gained a firm footing.

[Extract from "Barry's Fruit Culture."]

The Apple-Worm Codlin-Moth.

The ravages of this insect on the apple are becoming quite alarming, and unless its destruction be pursued with prompt and persevering efforts, our apple-orchards will soon cease to be profitable. The moth appears in New England, New York, and other places similar in climate, about the middle of June; further south earlier. It deposits its eggs in the eye or calyx of the young apple; in a few days they hatch, and the worm burrows into the core of the fruit. It can be traced by the brownish powder it casts out behind it. In some three weeks it attains its full size, and escapes from the apple through a hole that it makes in the side, and takes shelter in the scales of the bark of the tree or such other suitable place as it can find. The insects complete their transformations in two or three weeks, and produce a second brood of moths which lay their eggs, and again stock the apples with worms. The fall brood of worms remain in their cocoons during the winter, and appear in spring as moths.

Means of Destruction.

First: Scrape and clean the bark of the trees thoroughly early in spring, and see that no cocoons are left in the crevices. Second: Examine all barrels, bins, shelves, &c., where apples have been stored in cellars or fruit-room. Third: Place bandages of old cloth, carpet, or rags of any kind around the trunks and large branches of every tree, say by the 1st of July, to trap the worms; examine every week or two, and kill all the worms that have been trapped. Fourth: Pick or knock off every wormy fruit before the worm escapes, and destroy; pick up all that drop and destroy in the same way.*

Recently Paris-green has been used against the apple-worm with great success. The poison is mixed with water, and sprayed upon the trees as soon as the fruit sets. The calyx-end of the fruit then points upwards, and the poison will lodge in the blossom end of the apple. The young worms are poisoned as soon as they begin to eat into the fruit. The summer rains wash the Paris-green from the trees, so that even a chemical analysis will fail to show its presence in the autumn. It is said that a small amount of Paris-green, a table-spoonful to the barrel of water, is sufficient. The best way to spray large trees is to place a barrel of the liquid on a platform-wagon, which can be drawn through the orchard by horses. The fluid may be thrown upon the trees by any one of the several force-pumps sold for that purpose.

[Extract from the *Canadian Horticulturist*, October, 1884.]

Paris-green *v.* Curculio.

William Creed, writing to the *Fruit Recorder*, says that he applies Paris-green to his plum-trees at the time the curculio is depositing its eggs in the young plums, in the following manner, and that he finds that one application made at the right time, provided no rain follows immediately after, exterminates the crop of curculios: He reduces some glucose to a weak syrup, and puts a little of this—he does not say how much—into a common pail, and mixes thoroughly with it two-thirds of a teaspoonful of Paris-green. He thinks that this helps to keep the Paris-green in suspension. He then fills the pail with water, stirs the glucose-syrup mixture thoroughly and rapidly through the water, and with a garden syringe thoroughly sprays the plum-trees until fruit and foliage are covered with the spray. It will help to keep the Paris-green in suspension if the water is frequently forced back into the pail from the syringe while spraying the trees.

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* For the information of the public, we beg to state that Paris-green can be obtained at Kempthorne, Prosser, and Co., wholesale druggists, at 1s. per lb., and caustic soda, or caustic potash in 10lb. drums, at 8s. per drum. The whale-oil soap, or sulphur mixture, called the "Codlin-Moth Wash," is manufactured in San Francisco. Concentrated lye is to be obtained from the American Lye Company in San Francisco, in 1lb. cans, of 48lb. in a case, $3 50 cents. per case. Garden syringes are used for spraying the trees; or, for an orchard on a large scale, Gould's pumps, or Mesigot pump, with a San Jose spray-nozzle, can easily be obtained from San Francisco; but our importers will soon get them if there is any demand for them.

[Extract from the *Canadian Horticulturist*, May, 1884.]

CURCULIO AND PARIS-GREEN.

MR. EDITOR,—I was recently conversing with Mr. Biggar, of Winona, about his experiments in spraying his orchard with Paris-green. He told me that, while he was unable to form any opinion concerning the benefits or otherwise of the Paris-green upon his apple-trees, owing to the failure of the apple crop last season, he had reason to believe that the application upon plum-trees had a very beneficial effect upon the curculio. When his men were spraying the apple-trees they finished off by giving a showering to one of the plum-trees which stood next to the apple-trees. This plum-tree is one of a row of plum-trees forming a continuous row with the apple-trees, and this tree alone of all the plum-trees brought any fruit to perfection. From this tree he gathered four baskets of plums; but the fruit all fell off from the remaining trees. The variety is the "General Hand," but other trees of the same variety lost their fruit. The plums were about the size of peas when the Paris-green was applied. He used three ounces of Paris-green mixed with forty gallons of water, and sprayed the trees with one of Field's orchard force-pumps, which he found to be an excellent instrument for the purpose. If any other readers of your valuable magazine have any experience in the spraying of fruit-trees will they not have the kindness to communicate it to their fellow fruit-growers through the colums of the *Canadian Horticulturist*.

[Extract from the *Canadian Horticulturist*.]

THE CODLIN-MOTH AND THE CURCULIO.

IT was asked at a recent horticultural meeting in Michigan, whether it would pay to spray the apple- and plum-trees with Paris-green or London-purple, for the purpose of preventing the ravages of the codlin-moth, on the apple and the curculio on the plum. In reply to this, Mr. Cook stated that he had experimented on plum-trees by spraying with Paris-green and water, and that he found no curculio on those trees for several days after making the application; while on surrounding trees he could find plenty. Professor Beal had said that the codlin-moth could be destroyed in the same way: that the moth deposits its eggs in the blossom end of the young fruit, and that the worm as soon as it is hatched eats the poison and is killed. Allan Brunson spoke of a friend of his who saved his apple-crop by the use of London-purple, while his neighbours had no apples. Mr. Cook cautioned fruit-growers against the canker-worm next spring, and stated that they could be exterminated by spraying with Paris-green or London-purple. Mr. J. M. Eamans said that Professor Cook, of Lansing, recommended a teaspoonful of Paris-green to a pail of water.

[Extract from the *Canadian Horticulturist*, January, 1884.]

PUMP FOR SPRAYING FRUIT-TREES.

To the Editor of the *Canadian Horticulturist*.

DEAR SIR,—In the June number of your paper I saw an inquiry from Mr. George Strauchan, for a good efficient orchard force-pump, for spraying poisonous liquids on fruit trees, for the purpose of destroying the *aphis*, codlin-moth, canker-worm, and other insects so fatal to our fruit. Last year I used one of Field's orchard force-pumps, manufactured in this city. I used one-fourth pound of London-purple in forty gallons of water; kept it well mixed by pumping through the hose back into the cask; threw it above the tree, allowing it to fall back in a spray. I had nicer fruit than I had ever had before from this orchard; in fact, my pears were entirely free from worms, while my neighbours' were wormy, and most of their fruit dropped off. I can recommend Field's pumps for this purpose, and I believe it absolutely necessary to spray trees with poisons to counteract the ravages of these fruit pests.

Yours truly,

Lockport, 15th December, 1883. H. S. CHAPMAN.

EXTRACTS from Winter Meeting Fruit Growers' Association of Ontario, held in the Town Hall, Woodstock, on the 30th and 31st January, 1885.

QUESTION.—What is the best preventative and the proper time to prevent the codlin-moth from attacking the early harvest apples?

The President: I forgot to say to the members of the association that we have with us one of the foremost agriculturists of New York State, Mr. Woodward, of Lockport. Perhaps we had better call on him to answer this.

Mr. Woodward: Decidedly the same remedy will prevent the codlin-moth attacking the early harvest apples that will keep down the late codlin-moth; that is, apply some sort of poison, some Paris-green or London-purple, for instance; and the proper time to apply it is after the blossom has dropped, and while the apples, although it has appeared, has not got large enough to turn down. This is a specific for destroying codlin-moth. There are many ways in which the codlin-moth may be kept down. One is by pasturing the orchard with sheep and hogs. I do that every year; and at the same time that you have them there they manure the trees. We apply the Paris-green with a force-pump. We use one that is made in Lockport. The Paris-green is mixed with water, and wants to be kept stirred up while the spray is being thrown upon the trees. The nozzle of the hose should be very small in order to make the Paris-green go as far as possible.

The Secretary: I may say the force-pump referred to was advertised in recent numbers of the *Horticulturist*.

Mr. McD. Allen: I have tried Mr. Woodward's remedy, and it was effective every time I did so. I used about a teaspoonful of Paris-green to a pailful of water.

Mr. Woodward: There is another little feature in connection with the use of Paris-green that, I must say, is contrary to my notion of the fitness of things. Messrs. Moody and Sons, large nurserymen in our town, are large plum-growers. Last fall I went up and saw their orchards; and

Mr. Moody showed me a part of the orchard in which they had used Paris-green for the curculio, and another part in which they had not used it, and I was surprised to see the difference. I had not thought it was possible for Paris-green to kill the curculio; but actually, in the part of the orchard in which they had used the Paris-green, the trees were breaking down; while on the other trees on which they had not used the Paris-green, there were scarcely any plums at all.

Mr. McD. Allen: We have been using Paris-green for a number of years, but there is a prejudice against the use of it, simply because it is used in too large quantities. Some have hurt their trees by an overdose; but growers there, who have used it pretty generally, believe in it now.

Mr. Goldie: What time do you use it on the plum?

Mr. McD. Allen: It should be used very early, first when the fruit is nearly set.

Mr. Croil: Might I ask Mr. Woodward if some substitute might not be used for Paris-green, which would be cheaper and just as effective; for instance, a strong decoction of tobacco. Or what would be the effect of carbolic acid or some such thing?

Mr. Woodward: I have too much regard for the suffering of even insects to use tobacco on them. It is almost impossible to get two samples of London-purple of the same strength; but, if you buy the best grades of Paris-green, you get a more certain commodity; a good tablespoonful of it is plenty for a barrelful of water.

How to get rid of a damaging Orchard Pest—A Simple Trap—Effective Work in a Napa Orchard.

The Editor, *Bulletin.*

It is now time to take steps for entrapping this pest of our orchards, as they begin their work as soon as the fruit is set.

It is a serious question whether they will not make the raising of apples and pears an impossibility on this coast, in spite of all the legislation and invention of traps and devices for their destruction.

The hanging upon the trees of old fruit-cans containing molasses and vinegar has been extensively tried, and in most cases with unsatisfactory results. There is too much labour and expense involved for the number of moths caught in this way. The old sack around the body of the tree, which must be taken off and cleaned every ten days, is also a discouraging piece of business. Few men will be found willing to follow up these processes with the diligence and persistency necessary to insure success. Unless some simple and more effective remedy can be found, many will doubtless prefer to dig up the trees and abandon the fruit business.

I last year tried a method of catching the codlin-moth, which seems at once to me simpler, cheaper, and more effective than any other method I have heard of. It is this: Hang a lantern to a limb of the tree, set an apple-box on end under the lantern, place a pan half-full of water on top of the box, and a spoonful of coal-oil on the water. The lantern should hang just near enough to the water to clear it. Some have said that the codlin-moth is not attracted by a light, but I think all the moth family are alike in their liking for a light. The first night I caught two hundred moths with one light; the next night seventy; then I waited two nights, and the next time I caught probably over three hundred.

I believe that two lanterns in a ten-acre orchard, lighted two nights in the week, will keep the orchard pretty clear of codlin-moths.

There is little trouble or expense with this method. Every moth that touches the oil on the water is caught, and not a pint of oil is needed for this purpose during the whole season. The work should be kept up during the whole season.

My neighbour suspended fifteen hundred old fruit-cans in his apple-orchard of eight acres, and renewed the liquid in them two or three times. But from all that I can learn I conclude that I caught more moths with one lantern than he did with his fifteen hundred cans.

There can be no patent issued on this moth-trap. Every farmer has all the necessary machinery at hand. It can be tried without expense or labour. Let every apple- or pear-grower hang up at least one lantern and report results. It may be that this problem can be solved easier than some people have thought.

Napa, 22nd April, 1885. W. C. Damon.

[Extract from the New York *Weekly Witness.*]

The Codlin-Moth.

In my practice I have discovered how to destroy easily this insect in such numbers that it is no longer a pest; but I have never made this method known outside of the circle in which I live. I was instructed by a friend to place sweetened water on the bee-stand to catch the bee-moth. I did so, and went the next morning and found six moths, but on examination they proved to be the codlin-moth. I then determined to try an experiment to catch codlin-moths, and in the evening a basin of sweetened water was hung on the limb of a harvest apple-tree. To my joy and surprise I found, next morning, the liquid in the pan was completely covered with codlin-moths. I at once ordered the tinsmith to make me thirty-five or forty basins, holding a trifle over a pint each, with wire bales by which to hang them up. The place selected to hang the basins should be open and easy of access. No more liquid should be prepared than is needed for immediate use, for if kept long it will lose its ripe-apple or new-cider smell and taste. For thirty or thirty-five basins take a gallon of rainwater and sweeten it, and then add a little vinegar to give it aroma, for it is the ripe-apple or cider smell that attracts the moths to their liquid graves. I think sorghum molasses is best for sweetening. The time for commencing the use of the bath will depend on the season, somewhere from the 1st to the 15th of May, and it should be continued until July, when the first brood of moths will have been captured.

Codlin-Moth.

To the Editor of the *Hobart Mercury*.

Sir,—In reply to the letter of the Ven. Archdeacon Hales in to-day's issue, I would like to point out that where infected orchards have been dealt with by acts of nature rather than Acts of Parliament, and by bird and insect inspectors rather than human inspectors, they have been well-nigh utterly ruined, as witness the bulk of the orchards in the north of Tasmania. Prejudices of theories must give way before facts. The following fact, set forth in a letter from the Department of Agriculture, Washington, to Mr. F. Abbott, of our Botanical Gardens, should have the effect of weakening, if not removing, prejudices against legislation and compulsory measures for the eradication of this pest. The letter was read at one of the meetings of the Royal Society by Mr. Abbott. I here quote from the letter: "As an instance of what concerted action can do, I will cite the experinece of the Peninsular Farmers' Club of Grand Travers, Michigan. This club passed resolutions that all the orchards on the peninsula should be bandaged. In case the owners would not attend to it, the club bandaged the trees for them. The result was that, although before they began 75 per cent. of their fruit was destroyed by the codlin-moth, after three years' trial only 5 per cent. was lost in that way." I think, Sir, with such a fact before us, we need not hesitate to pass an Act which, *inter alia*, will make bandaging of all infected trees compulsory in such districts as may be, by the expressed wish of the majority of the orchard-owners, proclaimed infected. Yours, &c.,

Westella, 4th September. B. Stafford Bird.

[Extracts from the *Pacific Rural Press*, 4th October, 1882.]

Remedies for Scale Insects.

In 1881, Mr. J. H. Townsend, of Santa Clara Horticultural Society, placed at our disposal a large number of trees infected with scale for the purpose of being experimented upon. These experiments showed the inefficiency of some measures, and on the other hand showed a certain means of destruction of the scale insect. The following are some of the results obtained:—

1. Concentrated lye, 1lb.; water, 2 gallons.—10th March, 1881: applied by spray on two peach-trees infected by scale; washed in the afternoon when the trees were dry. Effect: scale killed; buds and twigs not injured; the tenderest wood killed also. 5th July, 1881: New wood grown over the trees 4ft and 5ft. long.

2. Concentrated lye, 1lb.; water, 2 gallons.—10th March, 1881: Applied by spray on two peach-trees infected by scale; washed in the morning when the trees were damp with dew. 5th July, 1881: Scale killed; buds and twigs not injured; fruit abundant and trees healthy.

3. Concentrated lye, 1½lb.; water, 1 gallon.—Poured in on two pear-trees infected; lye so strong as to burn bark and foliage; scale entirely destroyed; bark being restored and new foliage appearing.

4. Concentrated lye, 1lb.; water, 1 gallon.—5th July, 1881: Applied on apples badly infected; bark and leaves burned. 2nd August, 1881: Scale killed; bark and leaves being rapidly restored. These trees have since been killed through applying low grade of coal-oil.

5. Concentrated lye, 1lb.; water, 1 gallon.—Tried on almond-, pear-, and apple-trees. Washed with brush in order to destroy the "red spider," which had been tried before with weaker solutions. No scale on these trees. The result was successful at the time, but some months after it reappeared. Whilst it will kill a large number, it cannot reach all the eggs. The effect on the trees generally was wonderfully good.

6. Concentrated lye, 1lb.; water, 1 gallon.—Experiments on 357 Ichworth plum-trees. There were 126 washed with this, February, 1881. Eight trees badly infested with scale; some were tried with a weaker solution; did not completely destroy, though so injured they did not breed. Then washed with the stronger solution, which effectually killed the scale. Two were found some time afterwards that had not been washed with the strong solution, and they were covered with scale.

7. Concentrated lye, 1lb.; water, 1½ gallons.—Out of five trees tried with this, the scale was killed on three. The others, washed again four months afterwards, had not appeared. On a Bartlett pear-tree entirely dormant, being washed with lye, 1lb. to the gallon of water, destroyed the scale. With plum-trees same result. Whale-oil soap and sulphur mixture, with lye added, has been successful. Should, after two years' experience, the scale again appear, my treatment shall be 1lb. lye to 1 gallon of water.

The following experiments were on trees badly infested with scale:—

8. Concentrated lye, 1½lb.; water, 1 gallon.—24th June, 1881: Applied to two Clairgeau pear-trees; brush used; many limbs dead from effect of scale. 27th June: Trees burned considerably; scale killed where reached. 24th July: Bark showing healthy appearance. Trees still better. 2nd August: No sign of scale; bark being restored rapidly; fruit quite clean. 25th April, 1882: Found trees with very healthy top and new bark where burned with lye; where not washed scale still existed. 14th October, 1882: Growth of new wood and bark healthy.

9. Concentrated lye, 1½lb.; water, 1 gallon.—Applied on portion of a tree to ascertain effect on bark. 23rd July: Where washed shows much less stain, lighter in colour and green layer restored. 2nd August: Stain disappearing.

10. Concentrated lye, 1lb.; water, 1 gallon.—Tried on pear-tree. Scale where reached entirely destroyed; bark burned by the lye, but healthy where previously sound.

11. Concentrated lye, 1lb.; water, 1½ gallons.—Tree washed same as above, with about same results. 14th October, 1882: Tree nearly destroyed by scale last year, but little new wood.

12. Concentrated lye, 1lb.; water, 2 gallons.—Same as above, except that the scale was worse; shows little new wood, but that healthy.

13. Concentrated lye, 1lb.; water 3 gallons.—Washed tree with spray. 1st April, 1881: Proved too weak to destroy the scale. 23rd July: Young scale-insects covered the tree; left to itself. 25th April, 1882: Scale killing tree. 14th October: Tree dead.

14. Concentrated lye, 1lb.; water, 5 gallons.—Applied to two trees; one slightly one badly infected with scales, on the 23rd June, 1881; only on the trunks was the wash used. 2nd July: No effect produced on the scale where not reached by the lye. 14th October, 1882: The tree covered with scale, but far less where washed with the lye; the bark, where washed, was healthy.

Use of Kerosene.

15. 1st June, 1881: Low grade, 110° test.—Showered over the entire trees; foliage killed, trees affected; scale killed. 2nd July: New leaves budding out. 23rd July: New foliage all over trees, shoots 6in. long, no scale, bark healthy. 2nd August: Foliage increasing, trees gaining in health. On the 25th April, 1882, these trees were dead.

16. Kerosene, high grade, 150° test.—1st June, 1881: Applied spray on two pear-trees; found on the 27th that foliage had not been killed, but the scaled destroyed. 2nd July: New-leaf buds coming out. 2nd August: Trees appear healthy, no scale showing. 25th April, 1882: Trees dead.

17. Kerosene, high grade, diamond brand, 150° test.—27th July, 1881: Applied heavy spray over entire trees (pear) badly infested. 2nd August: Scale destroyed; trees and foliage appear healthy. 25th April: One tree dead, the other nearly so. 14th October, 1882: Trees dead.

18. Kerosene, same brand.—27th July, 1881: Applied by spray atomizer. 2nd August: Same effects produced as in No. 17; scale appears to have been entirely destroyed. 25th April, 1882: Tree not dead, but with many scales upon it. 14th October, 1882: Old wood dead, but new wood from near the ground.

19. Gasoline, applied upon pear-tree by heavy syringe-spray thoroughly over the tree and foliage on the 27th July, 1881.—2nd August: Not effectual in destroying scale—too volatile; many insects killed, large portion unaffected; no apparent effect on tree or foliage. 25th April, 1882: The tree has been almost killed by the scale. 14th October, 1882: Tree still alive; scale.

20. 27th July: Applied gasoline by spray atomizer to pear-tree. 2nd August: Result same as preceding. 14th October, 1882: Did not suffer from application; no scale; clean and healthy.

Whale-oil Soap and Sulphur.

21. Mixture, 1lb.; water, 1 gallon.—23rd June, 1881: Applied spray over pear-tree, covering foliage and fruit. 23rd July: Scale killed, tree gaining health, bark restored, fruit improved. 2nd August, 1881: Tree and fruit improving. 28th April, 1882: Tree healthy, appears free from scale; bark fully restored, fine top, new growth. 14th October, 1882: Tree healthy, but some scale, however; orchard badly infested, hence their return; wash weaker than this described is ineffectual.

Soft Soap and Sulphur.

22. Soft-soap, 1lb.; sulphur, 1lb.; tobacco, 1lb.; water, 3 gallons.—5th July, 1881: Applied spray to two trees. 23rd July: Seemed effectual, many scale destroyed; trees not affected by wash; fruit improved. Subsequent observations showed little done towards destroying the scale. 14th October, 1882: Shows abundance of scale. This wash was used with good effect in another orchard (1st June, 1881) on a Fellenburg prune; scale not returned.

23. Soft soap, 1lb.; sulphur, 1lb.; water, 3 gallons.

24. Soft soap, 1lb.; water, 3 gallons.—The two washes named above were applied, 23rd June, 1881, with no effect, neither has it shown any result this season.

Whale-oil Mixture.

25. Whale oil, 1 pint; kerosene, 1 pint; borax, 1 oz.; water, 1 gallon.—23rd June, 1881: Applied spray to pear-tree different times in 1881; showed oil injurious to tree, therefore not recommended. Applied to another tree one-fifth the strength indicated; no effect on scale or tree. 25th April, 1882: First tree treated nearly dead; having cut top off, new wood coming; scale appears to be destroyed. 14th October, 1882: Old wood dead, new wood springing out lower portion of tree; shows some scale.

Carbolic Acid.

26. Carbolic acid, 3oz.; water, 2 gallons.—23rd June, 1881: Applied by spray, pear-tree badly infested with scale. 27th June: Failed entirely; showed insects both male and female. 23rd July: Tree covered with young female insects, commencing to be covered with their scale. 25th July: Bark scraped clean on this date, was in two days covered with young scale. 2nd August: Tree entirely covered with scale; two or three winged males were found. 25th April, 1882: Tree almost dead from scale. 14th October, 1882: Shoots have grown from the trunk of the tree, but the whole so seriously infested as to be worthless. The entire orchard in which these trees are situated other than the ones experimented upon—from eight to twenty-six—were washed last winter with a low grade of coal-oil called "tree-wash;" result not satisfactory. The owner tells me (14th October, 1882) that he is satisfied the oil has injured the trees.

Applying the Lye.

The strength of the lye 1lb. to one gallon of water where trees are infested with scale. Where it is only desired to cleanse the tree from moss, 1lb. to three or four gallons of water is sufficient. The best method of applying the concentrated lye is by dissolving in boiling water and throwing

it upon the trees with a force-pump through 40ft. or 50ft. of 1½-inch rubber hose, to which is attached a nozzle, having for its opening a simple straight slit very narrow in width and one-sixteenth to one-eighth of an inch long. The best spray-tip yet devised is that made at San Jose, called the "Merigot Spray-nozzle." The pumps most used for this purpose are the "Gould" and "Merigot." The latter is cheaper. Great care should be taken to cover the tree entirely with the solution of lye, as upon its thorough application depends its success. One of the greatest difficulties in the use of strong materials is from the sprays falling upon the person of the operator and burning and injuring the skin. In order to overcome this obstacle I have devised a simple extension-nozzle of slight cost, which is very light, and which may be made of any length desired, say from 4ft. to 15ft., or even longer. By the use of this it is easy to spray any orchard tree without danger. The cost is as follows: Gould pump, $16, without accessories; Merigot pump, $12; suction and long hose, 15c. to 25c. per foot. Merigot's spray-tip, if purchased alone, $1 50c.; if with pump, $13; bamboo extension, with globe-valve 7ft. long, $2 75c.; all over 7ft. 25c. per foot. The concentrated lye, in 1lb. cans by the case of 48lb., $3 50c. per case; English caustic soda, in 600lb. drums, $33 to $35 per drum. Whale-oil soap and sulphur mixture, called the "Codlin-moth Wash," is manufactured in San Francisco, and the price can be obtained by inquiry of Messrs. Allyne and White. In conclusion I will give the analysis made by Professor Hilgard, of the State University, of a sample can of American Lye Company's concentrated lye. The can sent I took from a lot I had been using, and supposed to be a fair sample of the manufacture. Analysis is as follows: Caustic potash, 8·3; caustic soda and carbonate of soda, 91·7: 100. With this I submit my report, expressing my firm conviction that ere long we shall be freed from the ravages of one of the most dreaded pests known to horticulturists.

MEMORANDUM FOR THE COMMITTEE FROM W. M. MASKELL.

I.—*Question 3. Scale-blight. Question 7. Acacia and Wattle.*

IT has been the habit of gardeners and others to treat scale insects here as they would in England, under the impression that those out of doors would do no great harm. The result is that these insects have increased to a very great extent, and to my own knowledge have effected very great injury, not only to fruit-trees, but to plants of all kinds; principally, as I imagine, on account of the comparative mildness of our winters. The New Zealand fauna is particularly rich in indigenous scale insects; more so, perhaps, than that of almost any other country; and the introduced species seem also to find a very congenial home here. I am particular in drawing attention to this point, because it seems not unlikely that a great part of the injuries to our trees, which appear at first sight to be of independent origin, may be in the first place induced by the attacks of scale, so numerous are these insects, so persistent their operations, and so rapid the weakening of the tree in consequence of them.

Economically, the scale insects may be divided into two classes: 1, those which attack the bark of the tree; 2, those which attack the leaves. As a general rule, it may be said that the former infest by preference deciduous, the latter evergreen plants; but there are many exceptions. Of the first class, the type most prominent and most injurious up to the present time is the common apple-scale—*Mytilaspis pomorum*. This scale has been found by me upon the following trees and shrubs in New Zealand: Apple, pear, plum, peach, apricot, gooseberry, currant, lilac, elm, ash, cotoneaster, thorn, sycamore, plane, maple; all introduced plants. It is found clustering thickly upon the bark of the trunk or branches, covered over by its elongated, mussel-shaped shield, and, in early spring, the young newly-hatched larvæ (very minute reddish specks) may be seen travelling about in search of a resting place. In the greater portion of New Zealand there is only one generation of this insect in the year; possibly in the warmer parts of the north (as in the extreme southern portion of the United States) there may be two. The insect is only active in its earliest larval stage; very soon after birth it casts off all its legs and becomes stationary under its covering shield.

Two things result from what has been here said. First, that as *Mytilaspis pomorum* is found almost entirely upon the bark of deciduous trees, there is a specially easy time of the year for attacking it—namely, in winter time, when the tree is bare and accessible. Secondly, that as the hatching of the larvæ takes place in early spring, and as the insect during the remainder of the year remains stationary, the point to be aimed at is the prevention of the egress of these larvæ from beneath the shield covering the mother and the eggs.

The shield is convex above, almost open beneath, adhering not altogether closely to the bark by its edges; and under it the female insect lies like a minute slug, gradually shrivelling up as she fills the shield with eggs. Consequently, the third thing to be noted is that the simplest and best mode of destruction would be either displacement of the shields and insects by rough brushing, or the employment of some liquid which will insinuate itself under the edges of the shield and surround the eggs. The first method is to some extent successful enough, but many shields are necessarily left untouched by it, and it is a troublesome business. The second is the best and most satisfactory.

Of all liquids available for this purpose kerosene seems to be the best. Of course, the application of kerosene requires care, and it should not be used too freely; and, as a matter of precaution, it should be mixed with some other substance. I have frequently recommended the addition of linseed oil, or of soap and water; in the latter case the mixture can only be a mechanical one. For the former, the proportions might be one-fourth kerosene to three-fourths linseed oil. Such a mixture has been, to my own knowledge, quite successful in several instances. Instead of linseed, some persons have used whale oil with equal success. But there is this point to be remembered: that the action of an oily varnish, as this may be called, must tend in some degree to the stopping up of the pores of the bark, and, consequently, unless used very thinly, to some damage to the tree.

I have been sometimes much blamed for recommending this method, by persons who asserted that they had thereby killed their trees. It was found on inquiry that in their eagerness they had painted over their trees as if they were painting a house with a good thick coat of oil.

The use of kerosene and soapsuds is not attended with so much risk, but its application requires for success a few days of fine weather without rain. I cannot speak positively as to the best proportions for this mixture, but probably they would be as follows: 1 pint kerosene, ½lb. soap, 5 gallons water, to be kept well stirred.

The result of the foregoing observations is, therefore, that for the destruction of the apple-scale (*Mytilaspis pomorum*), or any of the allied bark-infecting scale insects on deciduous trees, the time selected should be midwinter. The trees should be pruned and topped so as to lessen the labour required as far as possible, and they should be brushed over with a solution of kerosene in either linseed oil, whale oil, or soapsuds, For oily mixtures lay them on not too thickly; for soap mixtures, choose fine settled weather. If after application it is found that the eggs under the shields are in many cases unhurt, apply the remedy a second time. It must be borne in mind that it is only the eggs which have to be considered; the female insect at midwinter has finished her career and need not be thought about.

The class of scales infesting the leaves, or both leaves and bark of either deciduous or evergreen trees, may be represented by four principal insects in this country—namely, (1) the camellia-scale, forming a white cottony egg-nest; (2) the black-scale, also on camellias, with other trees, forming no cottony egg-nest; (3) *Dactylopius*, or the "mealy bug;" and (4) the wattle-scale (*Icerya purchasi*), forming large white cottony egg-nests. All of these are generally accompanied by a quantity of the black fungus, noticed under Question 9, which arises from the gummy secretion which they exude, and which drops upon the leaves and there decomposes.

Two main difficulties occur here as to all these insects, and a third difficulty as to the last two: First, they are mostly found, when stationary, on the lower sides of the leaves; secondly, the trees and plants they prefer being generally evergreen, it is not at all easy to reach them when they are on the bark; thirdly, the two last, *Dactylopius* and *Icerya*, are active and vagabond during almost the whole of their lives.

The plant most subject to ravage by these insects are: for No. 1, the camellia; for No. 2, the camellia and many other garden shrubs; for No. 3, a large number of greenhouse and hothouse plants; and for No. 4, the wattle, orange, lemon, pine or fir, gorse, and others. *Icerya* may, indeed, be looked upon as the most dangerous insect pest in this country.

The remedy best adapted for these pests is still the same—kerosene; but the application is different. Here we cannot get easily at the insect or her eggs; and, as there are several generations in the course of the year, there is no particular season at which it may be said to be best to attack them. Their habitation being also usually on the underside of the leaf (except in the case of *Icerya*, which is not particular as to its position), even if we could reach the bark we should do little good; there is therefore a necessity to resort to the application of a liquid remedy by spraying. In a greenhouse, where the windows can be closed, fumigation with tobacco is good against the "mealy bug" (*Dactylopius*). In the open air, the only remedy likely to be effective is to spray freely over the infected plants the mixture of kerosene and soapsuds mentioned above.

In this operation care should be taken that the liquid should fall on the plant in as fine a spray as possible, so as to be more likely to reach every part, and fine weather should be chosen so as to give it the best chance. It must, however, be observed that the prospects of success depend in very great measure upon the accessibility of the leaves and twigs. There is no difficulty whatever in destroying scale-insects, if one can only get at them. Probably the quantity of kerosene in this case may be a little increased.

NOTE.—The acacia and wattle blight, referred to in Question 7, is, I suppose, *Icerya purchasi*, and has been included in the foregoing remarks. But this insect is probably the most dangerous of the scales as yet in New Zealand, and owners of infected trees should, in my opinion, adopt a much more drastic remedy than that suggested above. Experience at the Cape of Good Hope and in California, where this insect spread some years ago from Australia, tends to show that it must be fought by strong measures. That experience is summed up in the following sentences of an American expert, Professor Comstock: "The trees should be watched carefully, and if one is found to be infected it should be destroyed at once. Remember that no better investment can be made than to burn such a tree, and that no other time is so good as the day it is first found to be infested."

II.—*Question 8. Fir Trees.*

The pines most subject, as far as my experience goes, to insect pests in New Zealand are *Pinus insignis*, *Pinus halepensis*, and *Pinus silvestris* (Scotch fir). Two enemies have been observed to attack these: a green aphis, which appeared about Wellington some years ago, but which seems to have departed; and a brown or black aphis, which replaced the first, and is now vigorously devouring pines throughout the colony. This insect has been described by me somewhat fully in Vol. xvii. of the Transactions of the New Zealand Institute, 1884, pages 13-16, under the name "*Kermaphis pini*, var. *lævis*."

The remedy best calculated, I believe, to destroy this pest would be the same as that for scale-insects—namely, a mixture of kerosene and soapsuds sprayed freely over the tree. No purely mechanical application can be used on account of the dense foliage.

Experience in New Zealand has not yet been sufficient to determine whether or not this aphidian kills the trees. About Wellington a very large proportion, after passing through a more or less violent attack, and indeed in some cases after seemingly dying, have recovered. This may be seen easily in the Botanical Gardens. Some trees have certainly died, but they have been few; on the other hand, in Canterbury, as I have been informed by Mr. Armstrong and by the Hon. L. Walker, very many trees have been killed. Whether this may have been due to some previous

weakness of the pines or to defects of situation, &c.; whether the trees about Wellington will suffer from a second attack and succumb; whether the insect will make periodical visitations, and such like questions, cannot, I apprehend, be properly answered as yet. The answers received by the Committee from other persons will, doubtless, help towards a better knowledge of this pest; as far as my own experience goes the number of trees which have recovered has been far greater than the number of those which have been killed by *Kermaphis*.

III.—*Question 9. Other Blights.*

Arbor-vitæ, about Christchurch and (I think) about Wellington, is attacked and much injured by a green aphis, of which I have not as yet been able to examine the winged state. In the public domain, Christchurch, several trees have had to be cut down on account of this blight. I should think that the kerosene and soapsud spray would be a very effective remedy in this case as in others.

Pittosporum engenioides and *P. tenuifolium*, two of our handsomest garden ornaments, are much subject to attacks from an insect, probably of the genus *Trioza*, which, in its early stages, is almost indistinguishable from scale, and in its full-grown state is a winged fly. The damage done is not very great, and kerosene spray would be effective.

Cupressus macrocarpa is subject to some disease of which I can give no certain account. The tree seems to wither away, generally branch after branch, and die. I have failed in every endeavour to find an insect likely to cause this result. Further investigation seems necessary.

Many of our native trees and plants are infested by insects very closely resembling, in their earlier stages, scale-insects, but becoming when full-grown small four-winged, floury flies. These are species of *Aleurodes*, the "white-fly" of gardeners. The ordinary remedy suggested above against scale, applied before the flies are hatched, will be useful. These insects are seldom on the bark of the plant.

The black fungus, which so often covers many plants, *e.g.*, camellia, orange, lemon, &c., has been referred to on the sheet of questions. It is strictly a result of the presence of scale or aphis, and the remedy for it is to destroy the insects.

Wellington, 27th July, 1885.

[Extracts from the *Colonist*, Nelson, New Zealand, Thursday, October.]

THE BLIGHT QUESTION.

Report of Committee.

THE following is the report of the subcommittee elected to make inquiries and report upon the blights, which are proving so disastrous to fruit-growers and others, and the best means of dealing with these pests.

The Committee having circulated questions on various kinds of blight, specifying codlin-moth, scaly-blight, acacia-blight, pine-blight, and other blights, the Committee received answers from not more than six parties: Messrs. Wiesenhavern, Newman, Rout (Stoke), Hale (Waimea Road), Sheather, and Lowe, but as all of these were directly interested in the matter their evidence is of more than usual value, being practical and experimental, not speculative or theoretical.

The first on the list was the codlin-moth, and the questions on it were as follows, with the answers so far as they were given :—

1. When did you first notice its appearance?

Mr. T. M. Lowe: Codlin-moth well known to fruit-growers in England. I first observed it in Nelson in 1878.

Mr. John Hale: I have observed it for the last six years.

Mr. J. H. Newman: As soon as I came here, a year ago.

2. In what forms or stages have you seen it?

Mr. Lowe: Deposits its eggs on any part of the apple or pear, when the fruit is about the size of a marble. Begins to bore into the fruit in its pupa state till it reaches the core. It then retires and suspends itself from a thread until it reaches a place of concealment, either in the bark or just under the surface at the bole of the tree, where it remains unless disturbed until the following spring.

Mr. Hale: I have noticed it in the state of the moth, maggot, and chrysalis, on apple-trees and quince, in and about Nelson up to Wakefield. I knew such forms to be seen as the maggot in the apple up to the middle of January and earlier, now. It remains in maggot state till spring during October, November, December, and January, hatching, and goes straightway into the moth.

Mr. Wiesenhavern: In answer to this and the question as to the best remedy, the following answer is given: Codlin-moth *(Tortrix pomonana)*: This beautiful little dark moth, with many waving cross-stripes on its upper wings and a large bronze shining spot on each end of them, is difficult to catch, as it conceals itself during the day, and moves only at night to deposit its two hundred and fifty or three hundred eggs on the half-grown fruits. The small maggot eats into the fruits, causes it to ripen prematurely and to fall, and in this way destroys in many cases more than half or the whole of the crop. The habit of this grub to leave after maturity the fruit—mostly at night by its own thread—and to reascend the tree for the purpose of wintering in crevices of the stem and lower branches, has given a great help to combat its ravages. The usual remedy to catch the moth by large lanterns, lamps, or even by the windows of hothouses, prepared for the purpose, have done some good. Wrapping hay, straw, or rags round the tree to intercept the grub, have been practised in America with more or less good results. It was through Professor C. Becker, of the Girl's College, in Juterbog, near Potsdam, who for years made a study of the most destructive insects of the orchard, that paper-bands were first introduced. He found that these bands offered a more convenient retreat and a perfect trap for the maggots and other insects. To make doubly

sure that no insect should pass the band, he discovered an excellent sticky matter, *bramuta-leim*, which is now generally used on the Continent. This *liem*, however, is rather expensive for large plantations—it costs two marks (2s.) per pound at Home. Printers' ink, or a mixture of tar and train oil, will perhaps answer the same purpose if renewed from time to time. The bands, about six or eight inches wide, are of coarse brown wrapping-paper. To resist the influence of rain, and to prevent their absorbing too much of the sticky matter, they are first painted over with fine glue, and in this way will last a long time. The paper rings are bent over a little at the lower end to prevent the tar from running down the stem, and fastened round the trees a few feet above the ground, as the grub likes to go up as high as possible. The fastening must be done at the upper side of the band, by a string, in such a manner as to allow the insects to crawl under the lower part. The sticky matter is then put round the ring just below the string, and if the band fits to the bark close at its upper part, which is the main consideration, no insect will be able to get up the tree. The bands must be opened from time to time and put on again after the grubs, &c., are killed, which are either under the ring or fastened on the sticky matter outside. Of course the tar or printers' ink must be renewed as often as necessary to prevent the insects from crawling over the paper. The rings must be put on the apple-tree, plum, pears, and quinces included, if necessary, as soon as the fruit is formed, and left on the tree till the crop is gathered. Besides this it will be necessary to collect all worm-eaten fruit and destroy the maggots. All shoots, high grass, or anything by which the grubs may reach the tree above the ring must be removed. Old trees harbour a multitude of insects under their rough bark. This bark should be scraped, the scrapings carefully collected and burnt, and the trees and bigger branches washed with soft soap and water or lime. The greatest danger consists in sending old used boxes to the orchards. The grubs are imbedded in nooks and corners of the boxes, and brought in this way all over the country. The little moth itself is not able to fly very far.

Mr. Hale considered in 1884, in the month of April, the blight was increasing, but has no doubt that the band is the best remedy, and was successful in his own case. It is to be placed round the tree about a foot below the lowest limb. Lamps lighted in saucers of kerosene may be used with advantage in the proper season to attract the moths. The cracks and bark of individual trees also should be examined for the maggot.

The above remedies have been tried successfully. It is not so bad as it was. On the whole the visitation tends to greater care of the trees and so to a greater crop.

As to the cost of treating two thousand trees, this is a sort of estimate: Say 7s. for paper, and twine, 3s.; two men a day and a half each. When lamps are used in the moth season, fifty-two lamps, a quart of kerosene per night; but no good on moonlight nights. At first paid 10s. a week for trimming and lighting; now done by themselves, taking two hours each night to trim and light them.

As to bands, has known eighty taken out of the band of an old tree. Mr. Hale took out seven while the Bishop was there.

Mr. Lowe: In answer to the question as to the best remedy, "Have tried various remedies, and consider the following the best: As soon as the leaf is off the tree, well syringe with a solution of caustic soda, and follow up with three or four applications of alkaline salt in the fruiting season, and the result will be clean crops."

Mr. Rout (Stoke): The codlin-moth has been very destructive to the fruit in an old orchard of mine; and, in order to destroy some of the eggs and larvæ last winter, I scraped the bark off the trunks of the trees most affected, and dressed the same with some fresh lime slacked with chamber lye, used while warm, which I found very effective in destroying the larvæ and eggs, many thousands being destroyed; added to which those that fell to the ground were incorporated into some gas-lime spread round the tree-stems, and afterwards dug into the soil. The expense was small, and I think the remedy was effectual as far as it went.

Question: Do you advocate legal compulsion in reference to any of the above remedies?

Mr. Hale: Compulsion should be used to compel the use of bands. The duty of using these should be advertised once a year, and all bands be on and looked after by the police within a week, to be opened every fifteenth day. There is no necessity to make any new department.

Mr. Lowe: The question of legal compulsion is too deep for me to express an opinion upon. I consider it requires a great deal of discussion. I believe the blights are diminishing where they have been attacked in the manner that I have described.

Question: What is your practical opinion as to the value in this respect of small birds?

Mr. Wiesenhavern: In Germany, as well as in France, the protection of small birds is under the special care of the Government. Besides heavy fines, there are the standing rules that the children in the State schools are reminded not to interfere with the nests and the eggs of the birds. In both countries the great number of birds are considered to be far more beneficial to the crops than otherwise.

Mr. Newman: Having lived in the neighbourhood of Epping Forest, London, for over twelve years, I had the opportunity of watching the effect of the destruction of small birds, which at one time was carried on to a very large extent. As the birds were destroyed the blight of various kinds increased to an alarming extent, and was so noticeable that a small measure was hurried through Parliament called the Small Birds Preservation Act, and heavy fines were to be imposed on those destroying birds at certain seasons, and which was working with good effect some time before I left England. My decided opinion is that we need a much greater variety of small birds, with fewer sparrows, with some of a larger growth, such as the rook and sparrow-hawk. The small birds would not only enliven our fields and hedges with their various songs, but would well pay their footing by devouring the various insects and grubs that infest our fields and gardens. As cultivation of gardens and agriculture in its various forms extend, this important matter will have to be decided on to restore the balance of nature.

Mr. Lowe: I think that the martin and swallow, as insectivorous birds, are invaluable; and advocate their introduction.

Mr. Hale: I think birds are not of much use for this blight. Birds are at rest when the moth is flying about, and will not hunt for moths while the corn is ready for them.

Canker-Worm.

Mr. Wiesenhavern sends the following remarks in reply to the inquiries: This is the frost or winter moth at Home. It appears here about June and moves about till midwinter. The male is a dirty light-brown, 10mm. long by 30mm., with spread wings, while the female is wingless. End of June or July she crawls up the trees (apple, apricot, peach, and orange are mostly attacked), and deposits from two hundred and fifty to four hundred eggs on the buds and small shoots in clusters or singly. At the beginning of spring the light-greenish caterpillar begins to appear. It attacks fruit and leaf buds, destroys the young leaves, which it spins together, and prevents the development of new shoots. Afterwards it eats the young fruit, and feeds most greedily at night time. At Home the grubs go down into the ground about the middle of July to undergo their change; but here, owing to our genial climate, they simply roll themselves up in a leaf for that purpose. In fact, they seem to breed here more than once a season. They multiply to an alarming extent; dry springs are most favourably to them. They destroy not only the fruit crops, but a great many of the trees as well. Branches die off, the trees get weak, and the production of the fruit ceases. (*Vide* Dr. E. Taschenbug, Professor of the University of Halle, "Entomology for Gardeners;" and Dr. J. Ratzsburg, Professor of the Forest Academy in Newstadt, "Everswald Forest Insects.") To destroy this and other dangerous insects the Prussian Minister of Agriculture recommended Mr. Becker's paper-rings, and bramuta lime in 1869, and they were adopted by most of the horticultural societies in Germany. In 1873 the *Journal de la Société Centrale d'Horticulture de France*, Paris, recommended the ring and lime to all French fruit-growers; and at a meeting in Florence in 1874 the Comitato Executive della Esposiziane Internationale D'Orticultura adopted Mr. Becker's remedies, and made the professor an honorary member. The paper-bands against the canker-worm have to be put on shortly after the fall of the leaves, and have to be kept on till midwinter. As both the remedies against the codlin-moth and canker-worm are the same, it will be advisable not to remove the rings, except from September to the end of November; or, perhaps, better not to remove them at all. It certainly will come to a great amount of trouble to control these bands and perpetually renew the stickly matter upon the paper; but there will hardly be any other course left. Either we must undergo this trouble or we must cut down our fruit trees as useless.

Scaly-Blight.

Mr. Lowe says: "Belonging to the variety of insects of the family *Hemiptera;* its proboscis is formed for extracting the juices of plants, especially the apple, the pear, and the hawthorn. I first observed it in Nelson in 1877; it is also well known to Home and colonial fruit growers. I find the best remedy a strong solution of caustic soda at the fall of the leaf, and again just previous to the bud breaking. It quite eradicates it."

Mr. Hale has known the scaly-blight for twenty-five years in New Zealand. It is common in England under cover, in houses, on walls, on all fruit-trees; but there is a different scale on gum, walnut, oak, and ash. It is increasing. Caustic soda best remedy if used two or three times in proportion of 1lb. to 2 gallons of water, with as much unslaked lime as it will take up. Apply with a syringe. Another remedy is 1lb. of soft soap to 2 gallons of water, and 3oz. of sulphur flour, boil for half an hour. This will make a fine wash. Put some damaged tobacco, and boil with it. Mr. Hale further says, respecting these blights, "They seem to fall back, and we pass them by and let them work themselves out." "The American-blight is bad, but is nothing now to what it was. The Nelson Provincial Council passed a law against American-blight, but it was never put in force. The best remedy for American blight is Gishurst's compound, or a less expensive one—soapsuds and kerosene."

Acacia Blight.

Mr. Sheather says: "I first saw this blight, as near as I can remember, nine years ago, in Mrs. N. Edwards's garden, upon the mimosa, and it kept on increasing until almost every plant in the garden had some of it upon it; even in the conservatory, the plants in the pots had some of it upon them; but last year I had orders to cut all the mimosas down, and now at the present time, I should have to walk about for some little time to find any of the mimosa blight. I think myself that it is not going to be half so bad as some people think it will; in fact, I think very little of it."

Mr. Hale says: "He saw it in Mrs. N. Edwards's garden ten years ago, and all over the trees, and on every flowering plant. The best remedy is soapsuds; soda will kill it. Take a wineglass of kerosene with a gallon of water, and mix them with soapsuds. It will not do Nelson much commercial harm. All blighted trees should be cut up."

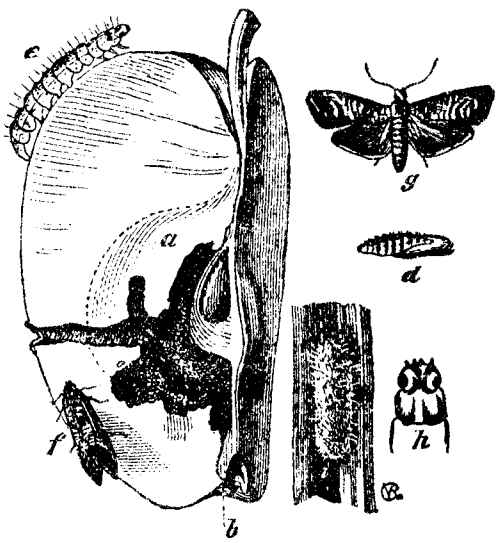
Mr. Lowe says: "It belongs to the family Coccidæ, better known as the 'mealy-bug.' Its habits are to conceal itself about the surface roots of the acacia-, wattle-, and currant-trees. It deposits its eggs in autumn in small bags, which they agglutinize to the branches of the trees. I first noticed it in Nelson in 1882. To destroy the parent insect, remove the surface soil two or three inches, and apply lime and water, or well pulverized retort-lime, replace the soil, and well syringe the tree with a solution of alkaline salt. Trees so treated last autumn that were badly blighted, this autumn scarcely show it."

The Black Leech

Mr. Streather says: "To my mind the black leech is the worst of all the blights; but I am very pleased to tell you that we have a remedy for that n the hellebore. I put two tablespoonsful

of the hellebore into a two-gallon bucket, and put one quart of boiling water upon it, stirred it up for a minute, and then filled up the bucket with cold water. I may say here that I did not think that that would kill the leech, but I took a common garden syringe, and put it on some plum-trees where the leech was on thick. I looked the next day; I still thought it was no good. I looked at them the third day, and to my surprise the leeches were all dried up. I used it many times after with the greatest success, and I am quite sure that the hellebore, used as I have directed, is a certain cure for the black leech."

Mr. Lowe says of the leech-blight: "Two-thirds of the family Hymenoptera, commonly known as the leech-blight, deposits its eggs on the leaf of the pear, the peach, the cherry, the nectarine, and the hawthorn; conceals itself in the bark of the tree or about the surface roots; enters the chrysalis state; the latter over part of the autumn, when it appears as a full-grown insect early in the summer. The remedy is a solution of hellebore wherever the eggs are observed on the leaf. I first observed it in Nelson in 1879.



CODLIN-MOTH.

(*g*) Moth with wings expanded.
(*f*) Moth at rest.
(*e*) Full-grown worm.
(*d*) Chrysalis.
(*h*) Head of worm magnified.
(*i*) Cocoon.
(*b*) Where worm enters fruit.
(*c*) Ravages of the moth.
(*a*) Core of apple.

By Authority: GEORGE DIDSBURY, Government Printer, Wellington.—1885.