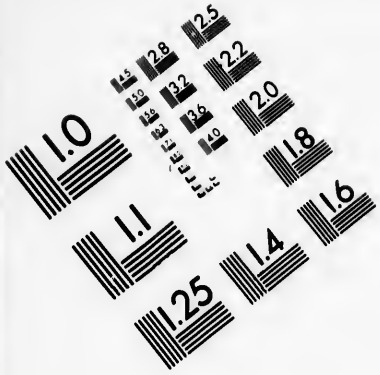

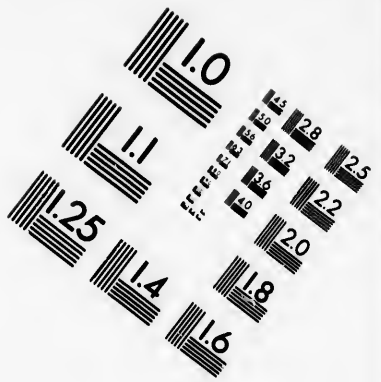

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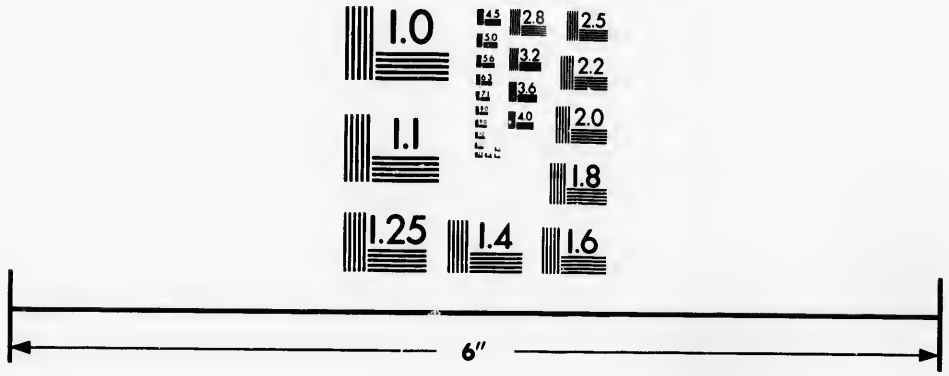

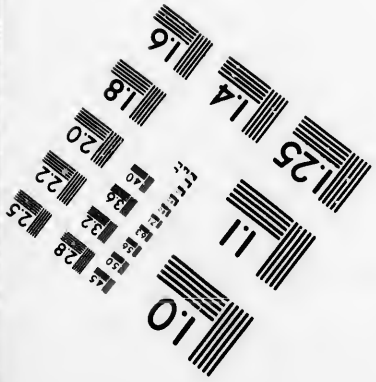

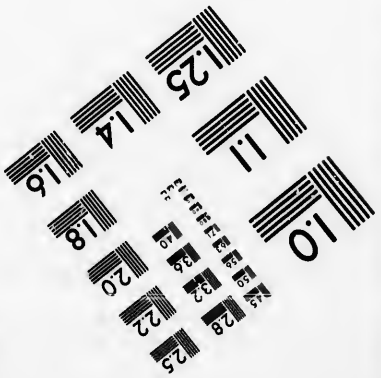

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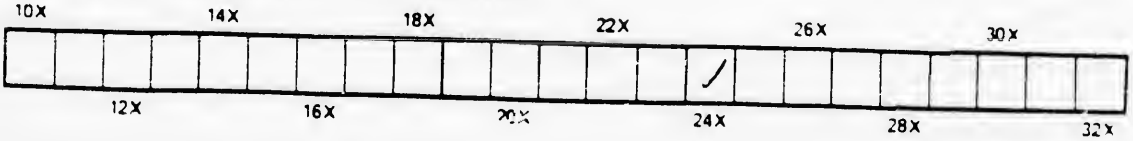

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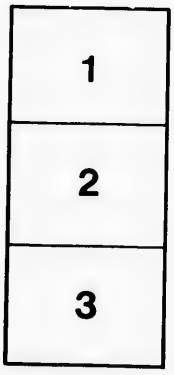

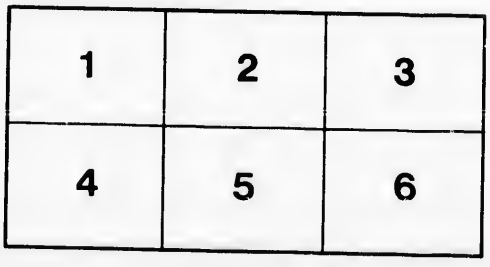

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EVIDENCE OF DR. JAMES FLETCHER

ENTOMOLOGIST AND BOTANIST, DOMINION EXPERIMENTAL FARMS

BEFORE THE

SELECT STANDING COMMITTEE OF THE HOUSE OF COMMONS

ON

AGRICULTURE AND COLONIZATION

MAY, 1898

PRINTED BY ORDER OF PARLIAMENT

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COMMITTEE ROOM No. 46,
HOUSE OF COMMONS,
FRIDAY, 13th May, 1898.

The Select Standing Committee on Agriculture and Colonization met this day at 11 o'clock a.m., Mr. Bain, Chairman, presiding.

The CHAIRMAN :—We have with us this morning Dr. Fletcher, Entomologist to the Experimental Farms. I introduce him to you.

Mr. FLETCHER:—Mr. Chairman and Gentlemen,—There are many subjects connected with the Entomologist's work which cannot, for lack of time, be treated of now before the Committee. I can only refer to some of the most important subjects. The one of the greatest importance, in that legislation has been enacted during the present Session concerning it, is the San José Scale.

THE SAN JOSE SCALE IN CANADA.

This insect had been discovered in the western part of Ontario early last year, and owing to the known injurious nature of this pest and the rapidity with which it had spread during the year in infested Canadian orchards, some measures were necessary to prevent the further introduction of the insect and to provide for it destruction wherever discovered. Four years ago the San José Scale was discovered in British Columbia and prompt action was taken by Mr. Palmer, of the Department of Agriculture of British Columbia, to have it stamped out. I was sent there by the Honourable Minister of Agriculture to investigate the matter, on account of its importance, and found that Mr. Palmer had done his work so thoroughly that there was no trace of the Scale to be found at the time of my visit. The frequent intercourse between British Columbian fruit growers and those of California and Oregon, and the large amount of nursery stock imported from these States have resulted in the pest being introduced again into British Columbia. In December, 1896, undoubted specimens of it were sent to me by Mr. Palmer. Early last spring I found through one of my correspondents, that the Scale occurred in injurious numbers near Chatham, Ontario. The matter was at once attended to and inquiries set on foot as to the occurrence of the Scale in other parts of Ontario. During the month of June last the Minister sent me to the Niagara district to examine one of the large orchards which was found to be infested. Several leading fruit growers accompanied me to the orchard of Mr. C. Thonger, at Niagara. Professor Panton, of Guelph, was also invited to come with us. We examined Mr. Thonger's trees and held a meeting in the orchard. We found that the scale had spread through Mr. Thonger's orchard during the previous season and had increased enormously on trees which had been found infested the year before. I was deputed by the Minister to explain to the fruit growers present what the nature of this insect was, and also to take their views as to what they thought were the wisest measures to adopt with regard to it. The Ontario Government has been taking active steps to have this pest stamped out. An inspector of spraying has been appointed, viz., Mr. W. M. Orr, of Fruitland, Ontario, who has pushed the inspection of the orchards of the province energetically during the

year. Professor Panton promptly published an excellent bulletin on the Scale, and otherwise has done good work by giving the fruit growers of the province information as well as by showing how important it was to have it attended to at once, has helped to stamp out the pest.

PERNICIOUS NATURE OF THE SAN JOSE SCALE.

Statements have appeared in the newspapers that the San José Scale is merely an ordinarily injurious insect similar to many others we have had to deal with in the past. I might as well deny this plainly at once. All those who know anything of the subject acknowledge that this is the most serious pest that we as entomologists have ever had to study. It has increased and spread with enormous rapidity since its introduction into the States east of the Rocky Mountains, and has been the cause of great loss. It is probable that the San José Scale is not a native of America, although it was first discovered at San José, California, in 1870, and by 1880 it had done so much harm that it was described by the United States Entomologist as *Aspidiotus perniciosus*, the Pernicious Scale, on account of its injuries and the great difficulty of treating it. By the end of another decade the Scale had spread all over California and through Washington Territory and Oregon, and had done a great deal of harm. Indeed, the harm was so great that the Los Angeles Horticultural Commission reported in 1890 that "if this pest be not promptly destroyed it will utterly ruin the fruit industry of this country." Now, it was only discovered as an injurious pest in the orchards of the Eastern States in 1893—this is 1898—that is five years, and of course it has not been at work yet this year. Since its detection as a fruit pest in the orchards of the Eastern States, therefore, it is simply a history of four years. In that time, it has spread through the whole of the important fruit-growing States of the United States. It is not confined to one State, but is found in every fruit-growing State that touches our borders, and from which in the past we have imported a great deal of nursery stock. I do not know for certain about the State of Maine, but in every other State of those mentioned it has been detected, and it is known that wherever it occurs it has done a great deal of harm.

Some recent writers in newspapers have said that the entomologists are making a great hullabaloo about this insect, and they assert that there are no actual instances we can give as to its ravages. I will give you, gentlemen of the Committee, one instance of several. Although I have not seen this orchard, I have seen others in a similar condition, close to it and in the same State. This is a photograph of an orchard which contained 28,000 bearing trees which were so injured in three years by the San José Scale that half of them were dead at the time the photograph was taken, and the other half have since had to be cut down and burned. A full grown bearing peach tree may be valued at from $5 to $15, if not attacked by this insect. Now, if we value these trees as worth $10, you will see the large amount of money which has been actually lost in one orchard. In the States of Maryland, Virginia, New Jersey, and many other States the San José Scale is doing extensive injury at the present time.

LEGISLATION.

In regard to our Government's recent legislation looking to the control and exclusion of the San José Scale, I believe that it was both wise and necessary. Every care was taken that all information concerning the insect should be gathered together, and the Honourable the Minister of Agriculture hesitated a whole year before putting the Act through Parliament. It was said by some to be done precipitately and forced through Parliament in a hurry; but this was not the case. We considered it carefully and the wideawake nurserymen and fruit growers of

Canada demanded that the Government should do something. Last year letters poured in to the Minister, demanding some legislation to protect Canada from this insect which was doing so much harm to the south of us. There has been some adverse criticism because the word fruit was omitted from the San José Scale Act. This omission was made purposely. I do not believe that there is any danger of the Scale being carried to Canadian orchards on fruit. The Act has been made prohibitive. Prohibition was necessary. It was not a matter to hesitate about. If we were going to carry any measure at all it had to be an extreme measure. Our fruit growers recognized the importance of the case and were ready for it. Our nurserymen stated that they would not increase the price of their nursery stock, and I am happy to say that this has not been done to any undue degree. The demand for stock has of course given the nurserymen some trouble to supply it, but they have been able to meet all demands, and I know of no detriment to our fruit growers from inability to get the stock they required. Moreover, there is advantage to the buyer of fruit trees to get them from Canadian nurseries, for not only is it certain that northern grown trees will be hardier, but they will be free from this serious enemy. I have not been able to learn of a single instance where the stock of a Canadian nursery has been found to be infested by this Scale. It is different in the United States. I refer to the United States as a matter of necessity, not because I wish to antagonize the nurserymen of that Republic or run counter to their wishes, but because in the past so much nursery stock has been bought of them every year, and at the present time they are a source of danger to us. Not only has this action of the Government and Parliament of Canada been popular in Canada, but in the United States as well; it has been approved of by those people who think and who have expressed themselves without fear. Those who are best fitted to express an opinion are the entomologists of the different States who have had to study this matter and who know the gravity of the case. These gentlemen, almost with a single voice, have pronounced in favour of the Act we have passed. It is extremely popular here, and, as I say, extremely popular south of the border, except with a few nurserymen in the United States who had taken orders for delivery this spring and were, therefore, put to some small pecuniary loss. These orders were given by our people who did not recognize the serious nature of this insect pest and who did not follow a wiser course and get their stock from their own nurserymen—a course calculated to produce better results in many ways. Some people, however, seem to value things more the further they go from home to procure them. On the whole, however, notwithstanding some little inconvenience to those who wished to import trees and shrubs from the United States, the San José Scale Act has been a decidedly popular measure, both in Canada and in the United States. It has also had a very good effect on European markets where there is a recognition of the fact that Canada has taken every precaution to grow the products of her orchard of the very best quality and to protect them from the ravages of this terrible pest.

I will speak now as to the difficulties of detecting this Scale. The insect is very small and inconspicuous. Here are some branches which are affected, more or less, by the insect. This, first, is a branch very badly infested indeed, and you see the insect can be readily detected. Then there are branches less badly infested, and here is one very little infested. When a tree is badly infested the fact is very evident, and there is no difficulty in seeing the scales, but when it has only a few scales on it, it is almost impossible to detect them. On this very slightly injured branch you will see how almost impossible it is to detect the infestation. In the United States there is hardly a State that has not passed or has under consideration an Act prohibiting the importation of infested stock, but they all rely on inspection,

and I maintain that it is almost impossible to rely on any inspection that is practicable. It would be a most expensive business to inspect all trees that come into our country and find out whether they have any scales on them or not. It would require specialists to examine for the Scale and others to open and close the parcels, so that the plants were not injured. This insect increases with such rapidity that if you notice a single scale on a tree in the beginning of the season, by the end of the same season the pest will most probably have spread all over the whole tree as badly as on this worst branch. By the end of the next year it will have spread all over the orchard. That, at least, has been about its history since it was introduced from California into the east. It is sometimes said that it does not spread rapidly. It is true that it does not appear to spread rapidly at first, but at the same time it must be acknowledged that it does spread widely and rapidly, as is shown by its history east of the Rockies. From the time of its discovery, four years ago, in one State it has now spread over thousands of miles of territory so that almost every State is infested with it. Thus, both statements may, in a sense, be true. It may not spread very quickly at first, but it spreads very rapidly after a while. It is immensely injurious, killing trees in three or four years or rendering them so weak that although treated so as to prevent the spread of the Scale a tree once badly infested is practically worthless, and it is generally acknowledged that it is better, unless the tree is very valuable, to destroy it altogether so as not to run the risk of letting the insects spread.

The Government of Ontario has been somewhat criticised for having passed a Bill providing for the destruction of infested trees, and then paying 25 per cent on the value of the trees. It is said that this was not compensation enough. I think it is. A Government must help the country, but this must be done in reason. If an epidemic occurs, the Government cannot prevent it and cannot be held responsible for it, nor give bonuses to those who suffer. So, since the Government is giving this bonus, and it must be called a bonus, so that a serious injury to the community may be obviated, the people should congratulate themselves on getting anything at all, for it is a much more serious matter than the generality of people think, and it might have been necessary for the Government to demand the destruction of a source of public danger without giving any compensation. The Honourable Minister was criticised for forcing his Bill through Parliament so quickly. Everything depended on the measure being pushed through at once and quickly. At one time it was thought the Ontario Government were not doing as much as they ought, that they were not pushing the work vigorously enough, but there are many things which Governments do in their own ways that the public do not know about. In this case the Government was having the country inspected and finding out to what extent it was infested before carrying out these measures. It was found to be far more infested than people thought, and it appeared to be a more serious thing the more it was investigated. The Government of the Province of Ontario is now carrying out remedial measures with energy and doing the best possible for the province and for Canada at large. I think the San José Scale has spread more and is likely to be more injurious in the south-west part of Ontario than in the other parts of the country, although we do not know for certain but that it may spread in other parts of Canada. The pest has occurred in Canada only in British Columbia and Ontario. Its presence in our orchards is of such gravity that any extreme measures within reason are justifiable and proper. Both of these provinces have acted promptly and decidedly. While, therefore, this has been done in Ontario and British Columbia, where they have passed and carried out stringent measures, it was, in my opinion, eminently proper and extremely wise for our Minister to push his Act through quickly, so as to protect our important fruit industries from a serious enemy and the country from a very certain menace to its trade.

By Mr. Rogers :

Q. How far east has the disease spread ?
A. Only a few miles east of Hamilton, I believe.

Q. In British Columbia, was the latter outbreak near the same place as it was the first time?

A. No. The first was in the Okanagan Valley ; the later ones, on Vancouver Island. Mr. Palmer, the Inspector of fruit pests in British Columbia, had all the trees destroyed. This officer is a very able man and one possessed of courage with his convictions, who appreciates when a thing is of a serious nature, and not only uses extreme measures when necessary, but afterwards follows these up bravely. He has done good work in regard to this insect as well as with many other pests.

Reverting to my statements that this legislation was not unexpected and pushed through precipitately and that the fruit growers, nurserymen and fruit growers' associations of Canada had ample opportunities of knowing beforehand that such action was likely ; let me say that not only were many letters received from every province by the Minister of Agriculture recommending it, but so that no step should be taken which was not backed up by public opinion, he sent me to address meetings in all the provinces liable to be invaded by this insect. I went first of all to attend meetings in Ontario, then held meetings in several localities in Quebec, New Brunswick and Nova Scotia, and at all these meetings, extending over some three months, the statement was made that efforts were being made to get the Government to pass legislation of this kind, and that the Honourable Minister of Agriculture wished for advice from the fruit growers and representative men of the associations before such legislation was enacted. Thus, all the members of the leading associations had notice of it, and all the nurserymen who attended the meetings or read the notices of them published in the press had an opportunity of knowing what was going to be done in the event of it being found necessary to pass an Act. As I said before, representations were made to the Minister over a year ago, pointing out the wisdom of something being done to safeguard our fruit interests against this enemy. It may seem, perhaps, that I am giving undue importance to this matter, but I was asked especially to speak of it by one of the members of the Committee, and there is no doubt that it is well that all the people of Canada should know why this Act was passed. Those who were wideawake had ample opportunity to prepare for it, and as to rushing the Bill through in a day or two, that was necessary because as soon as it became known that there was a possibility of this Bill going into force, efforts were made to rush in United States stock from, in some instances, States known to be infested. Some of this was stopped on the border. A small amount of stock got through and a great deal of indignation was expressed against the Act by those United States nurserymen who were not lucky enough to get their plants entered before the Act was enforced.

Now, we may ask, Why should we be afraid ? Simply because some of our fruit growers have bought much cheap stock from the United States, and this cheap stock is, as a rule, poor, badly grown stock. I have it from a leading nurseryman of the United States that after all American orders have been filled no less than 80 per cent of the surplus remaining stock has in the past been sent to Canada. There was a demand in Canada for this cheap and bad stock, and our people have foolishly been buying and planting it in their, or what is more to the point, *our* Canadian orchards. The people of the United States by the advice of their official Entomologists are making great efforts to control this serious enemy of fruit trees and ornamental shrubs and are going to much expense in the matter as well as passing strict laws to prevent its spread.

REMEDIES FOR THE SAN JOSE SCALE.

By Mr. Rogers :

Q. When a limb of a tree is affected, would it be well to take that limb off ?

A. Certainly, but it is difficult to say whether you would remove all the scales, and if any were left they would soon spread all over the tree again. If trees are treated to free them from the scale this must be done in the winter and very thoroughly. The best treatment is to wash the trees with a potash whale-oil soap solution. This must be a strong solution made with as much as two pounds of the soap to each gallon of water. It must be a potash soap, else at the strength mentioned the solution will not remain liquid enough to spray. The best soap is Good's No. 3 Caustic Potash Soap made at Philadelphia. This firm, in connection with the United States Entomologist, has carried on a great many experiments to find out the best kind of soap. The firm has taken every care to prepare this special soap properly. It is an admirable insecticide, and the makers have taken every care in the manufacture, so that it gives excellent results. Soap is a material which may be used to great advantage against many injurious insects. The chief difficulty is that it is not uniform in composition, so that you are not always able to tell beforehand what result you will get.

By Mr. McMillan :

Q. Do you consider lye to be useful ?

A. It is of some use, but not so good as the whale-oil soap. The interest in insect pests which has been aroused with regard to the San José Scale has naturally had the effect of drawing the attention of many fruit growers and farmers to other injurious insects, and a great many kinds have been sent in for examination, under the impression that they might be the San José Scale. When the appearance of the San José Scale is known it is very easily recognized as a scale insect, but besides it there are one or two other scale insects which are not nearly so injurious, but which may be readily confounded with it. These add somewhat to the difficulties of carrying out the different Acts which have been passed, owing to the difficulty of distinguishing the true San José Scale from the other kinds of similar scales found on the same kinds of trees. As the Act demands that trees shall be destroyed if the inspector says that they are infested with the San José Scale, it becomes important to know, when a tree is infested with a certain scale, if it is the San José Scale or not. As I have said, there are two others which are extremely like it, and it requires very careful examination and a good deal of special knowledge to distinguish between these different scales. For that reason we have had sent into the department for examination and report a great number of specimens of these different scale insects from fruit inspectors and owners of orchards all through the country. This state of affairs has stirred up an interest in injurious insects which I believe, in the end, will have a beneficial effect on the whole country, because many people having now been frightened by this serious pest are attending to their trees much better, and in a few years I think our orchards will be in a far better condition than they are to-day or than they would have been, had it not been for the advent of the San José Scale, of course providing that we are able to control this latter and prevent it from spreading through our Canadian orchards. This insect is extremely inconspicuous, and that is one of the principal dangers with regard to it, for it is liable to be introduced on nursery stock even if the stock is inspected because it can be so easily over-

looked. It has been stated that there are certain methods of treating the San José Scale by which all stock can be disinfected by fumigation so that it would be safe to bring it into the country. Fumigation with hydrocyanic acid gas is probably one of the best methods of treating nursery stock, but unfortunately actual results have shown us that where stock has been treated by nurserymen, even professedly with great care in the past, there are instances where this treatment has not been effective. Therefore, in view of the above facts, I could not see my way to advise the Government to trust either to inspection or even to this fumigation with gas which might, if thoroughly applied, be perfectly effective, but which as practised by business men, past events showed us had not proved so in some instances in which it had been tried before the stock was imported. On the Pacific Coast the gas treatment for destroying insects is widely used and is found to be very satisfactory. There is also another method, namely, to spray the trees with a mixture composed of lime, sulphur and salt, which is there claimed to be perfectly effective. This again has been tried in the East, but like the gas treatment has not been nearly so effectual as in the West. Of the many remedies which have been tried for the destruction of the San José Scale, whale-oil soap, two pounds in one gallon of water will probably give the best results. This at least is the experience of the experimenters in the United States, where many different methods have been tried. If a tree is only slightly affected it may be treated if the remedy is used as recommended. If, however, it is badly infested it had better be dug up and burnt at once.

PARASITES.

By the Chairman :

Q. Is there a parasite which follows the San José Scale and other insects ?

A. Yes, there are several parasites but they have not developed yet in sufficient numbers in Canada to protect the orchards against the scale. In California during the last year or two, this insect has decreased in numbers and injurious effects, a fact probably due to the attacks of some parasite which, however, has not yet been recognized. There is also a fungous disease which attacks the scale in Florida. Professor Smith, of New Jersey, has successfully imported this fungus into his State, and efforts are being made to import it into Canada, but up to the present they have not been attended with success. Mr. Craig last year got some of the fungus from Florida and tried to introduce it into the Niagara district in some different localities so that it might spread amongst the insects and destroy them. So far there have not been any results that we have seen. In St. Catharines, last autumn, I found in one orchard scales that had been destroyed by another kind of fungus. This is now being propagated in the hope that it may be useful in controlling the spread of the scale. In summing up this matter I must say that I believe everything is being done and has been done, which was dictated by wisdom and common sense to protect Canada from the ravages of the San José Scale.

By Mr. McMillan :

Q. Will there be any danger from this fungus ?

A. No. The fungi which are parasitic on insects are of a different nature from those which attack plants, and are not in the least likely to leave their animal food and attack vegetation.

DISSEMINATION.

By Mr. McGregor:

Q. Is there any danger of bringing in the scale on imported fruit, such as oranges and pears, from California and other districts affected by the scale?

A. I believe there is no danger at all of importing the scale on fruit. The scale does not occur on orange trees in California.

There are several points bearing on this question which may be considered. In the first place fruit infested by the scale is conspicuously disfigured by purple spots, so that it is not likely to be packed. It is easily detected, and there are laws in all the infested States providing that fruit bearing scales shall not be exported, so that it is unlikely after a short time that any infested fruit will be exported, but, on the other hand, it may be said that it has been exported in the past. That, however, was before attention was so prominently brought to it as is now the case. Even if infested fruit were imported into this country it is very unlikely that the scale would get from that fruit on to the trees in orchards. The scale dies when once removed from the tree or fruit; it is only the young that are born after the scale has been imported into this country, that could possibly get to the trees. After the young are born they are able to crawl, at the longest, for about two days only; they are exceedingly minute, it requires a strong magnifying glass to see them at all. With good eyes you could detect them as a fine powdery dust, but nothing more than that. On trees badly infested, in the Niagara district, in June, one of my correspondents described the appearance of infested trees at the time the young were hatching as looking as if they were covered with powdered sulphur, because the yellow-coloured young bark-lice spread over the trees in millions. These insects are so minute that they cannot travel very far. The full-grown scales die very soon after a branch is cut from a tree, forty-eight hours is perhaps the longest time they can live on a severed branch, because they require sap to live on all the time, and by that time the branch would have dried up too much for them to get nourishment. The insect is attached to the tree by means of a hair-like sucker or beak and it is only while the tree is living that it can get the sap that it requires for its sustenance. If a bough were cut from the tree the evaporation of the moisture within two days, and probably within a few hours, would kill all the scales on the bough. It is only the young insects that are born while the bough is alive that can spread. On a dormant tree with a root like nursery stock at the time of shipping, the scales are also dormant and can last longer. Another point about bringing in the scale on imported fruit, the people who grow fruit in this country are not those who are likely to purchase the imported article. It would be bought chiefly in the towns and for the scale to get into the country districts would be practically impossible. Should a farmer buy a box of California pears it would be very unlikely that the peelings of these pears, which would dry up soon, would be carried into his orchard from his back yard or that the young would be born in these few hours that the peelings remained moist, and in that way be carried to the trees. I must say I can see no danger from the importation of fruit under existing circumstances.

Q. Is there danger from birds disseminating the disease?

A. Yes, there is danger from birds; they are one of the usual means by which the insect is disseminated. The minute young crawl on the birds which perch in infested trees, and are thus carried from tree to tree, but the birds which carry young scales to orchards would be hardly likely to be hopping about where the peelings were thrown during the short time that the young could be born. At a meeting held last spring in Washington, of entomologists, nurserymen and fruit

growers to confer with the Entomologist of the United States Department of Agriculture and to consider this matter, with the object of introducing a Bill into Congress, I asked the question distinctly of the nurserymen and entomologists there, if there was any single instance that had been put on record of the San José Scale having been spread by means of shipments of fruit, and was told that there was not. There is not a single instance known where infestation has taken place from fruit, and I cannot see how such a thing is in the least degree likely.

Q. You have done everything possible to have this pest stamped out?

A. I think so, and the British Columbia and Ontario Governments have also adopted drastic measures with the same object in view.

Q. There are lots of inspectors with us?

A. And they are working well, I know, for I am in correspondence with nearly all of them. Hardly a day passes that I do not get specimens sent in from some of the inspectors in Ontario for examination. Mr. Fisher, Mr. Orr, Mr. Bennett, and others, are doing everything in their power to make the Ontario Act effective and to learn all that is to be known about the San José and other allied scale insects.

By Mr. McMillan:

Q. I should have thought that the greatest danger in regard to pears and apples would be that the scale would be on the short stems attached to them?

A. The stems dry up very quickly. As a matter of fact, although they are frequently thick on the base or stem end of the pear I do not remember seeing them on the stem; of course they could be there, but I do not remember seeing them there.

By the Chairman:

Q. Have the States not legislated against each other on this subject?

A. Undoubtedly. Special Acts have been passed in many of the States, and others have legislation now under consideration. Only yesterday I received the new Act passed in New Jersey.

By Mr. McGregor:

Q. New Jersey is the worst State in the United States?

A. They have done so much good work under their active entomologist, Dr. Smith, that they are rapidly becoming one of the best States in the United States. The pest is getting out of the orchards in New Jersey into the forest trees, and that is another point of the many details I did not give in regard to this dangerous insect, it will attack almost every known woody shrub or tree. Every plant which has a woody stem this insect will attack, and if it once gets into our forests it will be simply a matter, then, of our having to trust to nature for its extermination, and nature, although usually sure, is sometimes slow in carrying out her work. We find in all branches of natural history where injurious species are studied that probably some remedy would be forthcoming in time, but as all our cultivated crops are grown under artificial conditions we must make use of artificial measures to protect our crops until such time as nature produces a remedy for those which increase unduly in numbers.

Q. If parties could not get Good's Potash Soap, would you advise the use of sulphur and common soap?

A. No. I would advise them to do the best they could with the ordinary whale-oil soap, which they can get in this country. Whale-oil soap is the material which has given the best results. Kerosene emulsion has also given good results and this well-known combination, which consists of coal oil and soapsuds is the standard remedy against plant-lice and scale insects. But I should now say a word of warning in regard to pure kerosene being used on fruit trees. This has been advocated very widely in some of the United States, and has given some good results when used carefully by specialists, and upon some kinds of trees only.

Q. But it would kill the trees off?

A. Not apple trees, it would appear from experiment; but peach trees it has injured. In my experiments it has not been successful, but men in whom I have every confidence have told me that they have secured good results from using pure kerosene, spraying it on to the trunks on bright days when evaporation goes on quickly. But I think that the safest treatment is with whale-oil soap or with the kerosene emulsion.

By Mr. Rogers :

Q. I see some trees at the farm with a bright coating on the trunks?

A. That is due to their being treated regularly every year with an alkaline wash to prevent the borers in the trunks which kill so many trees in Canada. Our trees are very clean, owing to the care Mr. Craig has taken with them for some years. The location of the orchard does not seem to be quite satisfactory, and we have lost some trees from time to time, but though our trees may die from other causes we have very seldom lost any from borers.

By Mr. McGregor :

Q. Would you wash them up as far as possible, even to the larger limbs?

A. Yes, for the borers; or do you mean for the San José Scale?

Q. Yes.

A. Oh, they should be sprayed. The potash soap I have mentioned can be sprayed with a spraying pump; the trees should be sprayed late in winter, before the leaves open. There are four or five broods of the scales in summer and that makes it difficult to destroy all in the summer when the trees are covered with leaves, as there are some young on the trees all the time. The covered scales are difficult to get at with any of the treatments recommended, therefore it is necessary to do very thorough work in winter when the whole tree can be covered with the spray.

Q. What is the best time to spray?

A. Winter treatment is the best, and it must be very thorough; infested trees should be sprayed after the leaves are off in the autumn, and again before the buds open in the spring.

By the Chairman :

Q. You speak of kerosene, is that what we know as coal oil?

A. Yes, but in the United States, where there are a great many more people than here it is usually spoken of as kerosene. It is simply the ordinary illuminating oil such as is generally used in lamps.

BORERS.

Q. What is the mixture for preventing borers in trees?

A. It is made with ordinary soft soap, diluted or made thinner with a strong solution of common washing soda. You make the solution of washing soda as strong as possible, and then thin the soft soap with that, and if this wash is painted on the trees on a clear warm day it will leave a thin, varnish-like coating on the trunks which will stay there for a number of weeks, and will prevent the female beetles from laying their eggs on the bark. The borers are the grubs of beetles which hatch from eggs laid on the bark; if this coating of soft soap and soda is painted on the trees the mother beetles will not lay their eggs there and the trees are safe.

Q. That would be death to all that kind of insect?

A. Yes, because the trees are rendered obnoxious to the bettles when they go to lay their eggs, eggs are not laid, and injury is prevented.

PEA WEEVIL.

Dr. Saunders told me, Mr. Chairman, that some gentleman in the Committee wished me to speak to-day about the Pea Weevil or "pea bug," as it is frequently called. The insect I refer to is the one which bores inside the pea and leaves a small round hole in the seed pea, through which the beetle emerges. The pea weevil we know does a great deal of harm every year. This harm, I think, is, on the whole, less than it used to be, because better measures are now taken by seedsmen and growers to disinfect their seed.

Remedy.—The bisulphide of carbon treatment is perfectly effective against this enemy. By using this chemical all the weevils inside the seed pease can be killed, and if clean seed, or seed in which all the weevils have been killed is sown, and seed is now treated regularly by growers, by that means the insects must, in time, be reduced. The trouble is, many of the weevils leave the seed in autumn and hibernate about the roofs, shingles or rafters of barns. In some seasons the proportion of the beetles that do this is large, but in other seasons the majority remain inside the pease, when, if the seed is properly treated, the numbers are much reduced, and it is in those years that we hear people say it is a "good year." By remaining inside the pease the insects are destroyed when the seed is fumigated, and therefore there are very few beetles left to lay eggs in the next year's crop. In the big seed firms they have "bug houses," special places where they can treat at once 100 sacks or more by putting them inside these air-tight chambers and then putting bisulphide of carbon on the top in shallow open vessels, so that evaporation may take place readily. When all the sacks are placed in the bug house, the bisulphide is emptied into the pans at the top and the whole is left tightly closed for forty-eight hours. The bisulphide vaporizes easily and the heavy vapour falls down through the pease and as they are kept tightly closed in, under the influence of this poisonous vapour all the weevils inside the seed pease are destroyed. It is best to treat the pease as soon as possible after they are threshed, so that the weevils may be killed before they have consumed much of the inside of the pea. The egg is laid on the green pod and the young grub hatches and eats its way inside and then penetrates one of the pease inside which it lives until it is mature. A very convenient way for farmers to treat their pease is to use an ordinary 45-gallon coal oil barrel. Pour five bushels of pease into it and then put three ounces of carbon bisulphide in a flat vessel on the top of the seed, close the barrel tightly, first with a damp sack on the top and boards on the top of that so as

to keep the whole tightly covered. If you buy seed from any large house you will almost always find that the seed has been treated before you buy it; but, if not, the pease can be easily treated in this way by the purchaser.

By Mr. McGregor :

Q. How many ounces of bisulphide did you say was used?

A. Three ounces to about five bushels of pease is the usual quantity used, or one ounce to every hunderd pounds of grain. The bisulphide vaporizes readily, becoming a colourless vapour. While I am speaking of it, I may tell you that this liquid is extremely inflammable. It is a colourless liquid like water and vaporizes at the ordinary temperature of the air. The vapour is very much heavier than the air; that is the reason it is placed on top of the seed to be treated; as soon as the liquid vaporizes, it sinks downward among the pease, destroying all the insects. It is extremely inflammable, as I have said, and if a light of any kind, even a lighted cigar or pipe, comes in contact with it a serious explosion may take place. It is very dangerous, and should be used out of doors or in an open shed, because out of doors there will not be an explosion.

By Mr. Semple :

Q. Does the pea weevil extend far over Canada?

A. No, it does hardly any injury outside of south-western Ontario. Many of our northern farmers are growing seed for United States merchants, because they can grow them without any weevil. We never have the weevil here in Ottawa. I once found one or two injured pease on the farm here, but that only showed that they can be imported in the seed but will not increase here to any extent.

Q. Where I live, in Fergus, they used to be bad, but the insect appears to have disappeared?

A. You are just outside its breeding range.

ANTS,

The CHAIRMAN:—That substance is useful for destroying ants.

Mr. FLETCHER:—As Mr. Bain says, this liquid is extremely useful for destroying ants, especially the Little House Ant *(Monomorion pharaonis)* that sometimes gives troubles in houses. It is very difficult to locate the nest, but if you can find out where the nest is and pour in a teaspoonful of the bisulphide the vapour will spread down into the nest and destroy the insects.

By Mr. McMillan :

Q. Will it be effective in destroying ants in the orchard?

A. It is the best method of destroying them. Make a hole down into the nests and pour a little down the hole, then cover up with a little earth and press it down with the foot.

By Mr. Calvert :

Q. We find in Middlesex that where they refrain from sowing for a year the weevils do not come in ?

A. The weevils sometimes do a good deal of harm there I understand, but if the seed is thoroughly treated there will be, year after year, less difficulty.

PEA BLIGHT.

By Mr. Penny :

Q. You made some investigations in Prince Edward County, did you not, into the cause of pea blight?

A. Yes ; the opinion I came to some years ago on this subject was that from the special adaptability of Prince Edward County for growing pease they had grown them too long; as it is said, the ground was "tired" of that crop, and so when there was a dry year the crop suffered, and what was called "blight" should have been called "drought."

THE PEA MOTH.

Mr. McMillan asked about the Pea Moth in Ontario. We do not see much of it here, but I understand that down in New Brunswick, Prince Edward Island and Nova Scotia the loss from it is enormous, frequently 25 per cent of the crop.

Mr. McMillan:—Last year and the year before we had a good deal of it in Huron.

By an hon. Member :

Q. How is it injurious ; does it affect the life of the pea ?

A. No ; it is a little caterpillar which works inside the pod eating into the seeds; you will sometimes find in a pod that four or five peas have been injured. In some parts of Quebec, last year, this was very bad indeed. It is sometimes called the "Weevil," but that is a mistake; this is the caterpillar of a small moth which eats the green pea while it is still soft.

By Mr. McMillan :

Q. This seems to be an insect that strikes the pea on the outside ?

A. Yes, it is a small moth which lays the egg on the outside. The caterpillar eats its way through the pod and destroys the pease. During last summer I succeeded in breeding this insect and finding out the time when it appears. It is a small moth that appears about the 10th or 12th of July. I found out from the experience of my correspondents that the pease sown early succeeded best, and in New Brunswick those that were sown early escaped, but in gardens people must have the larger late varieties such as the Heroine, Telephone and Stratagem. The only remedy is using the early varieties. One of my correspondents is going to try spraying the pease at the time that the pods are forming. Some may say that this is impossible, just as years ago they said that it was impossible to spray a whole orchard, but we now know it is possible and must be done if we are to get good crops of fruit. I think it is possible that good results may follow spraying pease for the pea moth with Paris green in the same way as apples are for the codling moth. This is very much like the codling moth in all its habits so that we may be able to treat it in the same way.

Q. We found that by sowing late we got the best results ?

A. What would you call late ?

Q. The end of May ?

A. Was there no trouble from the pease mildewing ?

Q. No ?

A. The reason early and late sowing are to a measure successful, probably is because if you sow early your pea is so far ripe that the young caterpillar cannot feed on it, and if you sow late it is not ready until the moth has disappeared.

By Mr. Bain :

Q. Its season is late, then. Is it as dangerous as the pea bug ?

A. I think not, but it is much more widely spread. It is not bad every year. We have not seen it at Ottawa, for instance, for two years. Four years ago it was very bad indeed. The fact is that this has been in the country as far back as we have any record of agriculture. One gentleman in New Brunswick, Mr. Wetmore, has traced the mention of it back for 100 years at least.

By Mr. Semple :

Q. I do not think it has reduced the yield very much ?

A. No; but it causes a great deal of expense by making necessary the hand picking of seed. It is impossible to get a good sample without picking it over.

By Mr. McMillan :

Q. It has been so bad with us that it has reduced the yield by one-third?

A. Indeed. That is just as bad as in New Brunswick and Nova Scotia. I hope that none of the members from those provinces will object when I say that I have very seldom seen a dish of green pease in New Brunswick or Nova Scotia without finding some of the little insects among the pease when they came on the table.

THE CARROT RUST FLY.

I am sorry to say there is another new insect which after this will demand attention, the Carrot Rust Fly, which has been very bad in New Brunswick for the last two years and, before that had been found at single localities in Quebec and Ontario. It is of unusual occurrence although when it does appear it is a serious matter. The maggot as soon as it hatches bores into carrots and burrows all through them, entirely destroying them for the table. I suppose for cattle it would not injure them much, but of course it does injure them to some extent. There are always a great many of these maggots in each carrot. It is a European insect, known for many years in Europe, and a figure and description of it appear in my forthcoming report. My reason for bringing it up now is so as to give our experience in case any member of the Committee should hear of it in his district before our Annual Report is issued. I should like to hear from any member who finds it in his district, and also with regard to any methods adopted to try and control it. I find that for a crop of carrots for stock it is best to sow early, but for the table you can get carrots of excellent quality even if you do not sow before the end of June.

By Mr. Calvert :

Q. What would you call early ?

A. Just as soon as you can get them in. The attacks I have seen have all been in the red carrots, but whether the large, short whites and others grown for stock are attacked I do not know. If sown late, they are very apt to be exempt from the attacks of this insect. Of course as a matter of precaution you should

never use the same ground for carrots if in the previous year the crop has been infested. The best method of treatment is to dust with carbolized sand along the rows directly after they have been thinned out. This is made very easily by putting a few ounces of carbolic acid in sand, mixing thoroughly and spreading along the rows just after thinning. All insects are attracted by the special odour given out by the crop. After thinning plants give out more of this characteristic odour because they have been bruised. Consequently they are more liable to attack after thinning or harrowing than at other times. By giving them a good dusting with carbolized sand or coal oil and sand, a different odour is present, and the insect is not attracted to the crop and consequently the eggs are not laid. This treatment has given good results here and also in England where I have tried it. Carrots when kept for household use are generally stored in sand in the cellar. In cases where they have been attacked, this sand should be treated in some way so that the flies may not hatch, either buried in a deep hole or put into the yard where there is wet manure so that the insects will be destroyed.

By Mr. McMillan :

Q. Is not land plaster a good thing?

A. Probably it is, for mixing with the carbolic acid or coal oil.

TENT CATERPILLARS.

Tent caterpillars were prevalent last year and have again been very abundant this year. The best remedy is to collect the eggs during the winter or the tents after the young caterpillars hatch in spring, this is generally before the leaves have opened. The white tents are conspicuous and they can be easily seen before the leaves have expanded very much. These should be collected, because, although the caterpillars are small, they soon grow larger and more destructive.

TURNIP APHIS.

Q. Turnips have been affected with us. You would find that the leaves would assume a whitish appearance at first and they seemed to be affected by some little insect?

A. Yes, that is the cabbage plant-louse. It attacks turnips and it has done a great deal of damage in some districts; when it first appears in a crop it is in small patches, but these rapidly increase in size. At the time the turnips are hoed and thinned this insect generally appears and good work may be done by destroying infested plants at that time. After hoeing and thinning the best results have been obtained by spraying the tops with ordinary coal oil emulsion, the ordinary mixture that is now well known, a dilution of one part of the emulsion to twelve of water. Spray the mixture thoroughly beneath the leaves as well as on the top and in that way you will destroy the pest before it has spread to the whole field. The effects of the lice are very apparent on turnips, the leaves turn a greyish colour so that the presence of the insects is easily detected; and they should be then treated promptly. The best implement to use is a knapsack sprayer with a nozzle which will throw a spray beneath the leaves. Whale-oil soap, 1 lb. in 8 gallons of water, may also be used.

APPLE APHIS.

By Senator Ferguson :

Q. We have had experience of a plant-louse on apple trees, particularly on the grafts and young buds, in the early summer in Prince Edward Island. It was very injurious to the fruit?

A. The Apple Aphis is very injurious just now to apple trees. It was injurious last year in August, but it is also injurious now when the buds are bursting. It is an insect easily treated, the treatment simply involving the spraying of the trees with whale-oil soap, one pound in eight gallons of water, or the ordinary kerosene emulsion. The insects are easily destroyed and further injury is prevented.

OYSTER-SHELL BARK-LOUSE.

The Oyster-shell Bark-louse is well known to everybody who has grown trees, but there is never a year in which there is not a great deal of inquiry made with regard to it. Its injuries every year are enormous all through the country. It belongs to the same family as the San José Scale, but it is not so injurious in its effects, in the character of spreading so quickly or in respect to attacking so many different kinds of trees. Because of this fact it is to a certain extent overlooked, but it is widespread all through the country and it does a great deal of damage every year.

Treatment.—The proper treatment of this insect is to spray the trees during the winter with either whale-oil soap, the mixture recommended for San José Scale, of one pound in two gallons of water, or with kerosene emulsion, one part of kerosene emulsion to nine of water, the ordinary remedy which is recommended and printed on our spraying calendars. There is one characteristic about orchards which are attacked by the oyster-shell bark-louse, and that is, we find in nearly every instance that orchards are not taken care of as well as they might be. It is now recognized in this part of Canada that it is a wise practice to cultivate the land under the trees, and, where trees are regularly cultivated so that the vigour of the trees is kept up, they throw off the attacks of many injurious insects. In orchards where the oyster-shell bark-louse is found it is wise first to invigorate the tree and in many instances the tree will throw off or outgrow the attack of the insect.

CUT-WORMS.

By Mr. Pettet :

Q. What would you advise to destroy the grub that eats tomato plants?
A. These are called cut-worms.

Remedies.—It is a common practice in Prince Edward Co. to make tin rings which are put around the plants. These are made at the canning factories, and they are a perfect protection, but the pratice involves a good deal of labour and expense. The same purpose may be attained with an ordinary piece of paper. I see that an enterprising firm in Ottawa has got up an excellent little device made simply of cardboard, with a slot cut in one end through which a tongue passes by which it is made into a ring to put around the plants. These are sold at 90 cents a thousand; they are made of waterproof paper, and are certainly excellent things. In crops such as onions and carrots, which are also frequently attacked by cut-worms, the remedies which are most useful are as follows: (1.) Poison traps are made by taking young succulent vegetation—weeds, grass, or clover, anything will do if it is green and succulent. Tie these plants in loose bundles, dip them in a strong mixture of Paris green, an ounce or two in a pail of water, and then distribute these bundles along the rows, every ten, fifteen or twenty feet in the field, or in the garden every six or eight feet apart. Cut-worms, as you are pro-

bably all aware are the caterpillars of moths which hatch from the egg in autumn and pass the winter as partially grown caterpillars, they come out in the spring at night and attack any vegetation they can find. The bundles of vegetation mentioned are more conspicuous than the plants which they are designed to protect and the worms being attracted to them poison themselves by eating this poisonous food. (2.) Another remedy is bran or shorts poisoned with Paris green, which can be applied moistened so as to be about the consistency of porridge and put in small lumps along the rows of the young plants that require to be protected, or it may be applied dry close to the drill. This mixture seems actually to be more attractive than the green plants. Last year we saved several rows of onions and carrots by this application where other rows not so treated were almost wiped out by cut-worms. For tomatoes I think the rings would probably be the best remedy.

By Mr. Calvert :

Q. You would put a ring around each plant?

A. Yes, at the farm we simply wrap a little piece of paper around the stem of each plant at the time of setting out—the caterpillars walk about on the surface of the ground and cannot climb up the smooth surface. As a rule, the plant protected with paper is saved until it has become strong enough to resist the attacks of these insects, or until their season is past.

By Mr. McGregor :

Q. We are troubled by the attacks of cut-worms upon the corn?

A. The protection of corn is a more difficult matter. It is almost impossible to treat a crop like corn which is grown in large areas. The best method is to destroy the weeds and to keep the land very clean the autumn before, so that there is nothing to attract the female moths when they are laying their eggs.

Q. They attack the corn very young?

A. This remedy is to be applied the year before. These cut-worms are the caterpillars of moths which lay their eggs the year before and are attracted to the land by plants growing there. Of course, with a growth upon the land such as clover, you cannot protect yourself. Fields of corn are also sometimes attacked by the White Grub and by wire worms. I do not think any practical treatment can be adopted, except for small areas.

By Mr. McMillan :

Q. My experience is that old sod is worse than clover sod?

A. Yes, that would probably be the case.

By Mr. McGregor :

Q. We have used lime to some extent?

A. It would have no effect on the caterpillars. Of course, corn is a grass, and insects that feed on grasses would be more liable to attack corn than those that feed on clover, although there are certain kinds that feed on clover and attack grasses as well.

By Mr. Rogers:

Q. Is the application of coal tar a preventive?
A. Not against the cut-worm.

PLANT-LICE.

Q. What is the best remedy for plant-lice?
Remedy. A. Kerosene emulsion, or whale-oil soap solution. A very good mixture for treating plant-lice is four pounds of waste tobacco soaked in ten gallons of hot water for five hours, one pound of whale-oil soap in one gallon of water, strain the tobacco decoction into the soap and apply directly to the trees with a spraying pump.

By Mr. Frost:

Q. Where do you get that whale-oil soap?
A. The demand has been so great that I think you can get it almost anywhere. Whale-oil soap is simply the commercial name for fish-oil soap—any fish-oil soap made with potash will do. It is not made from whale oil at all. A great many experiments have been tried in the United States where entomologists have recommended a particular brand as being made with great care. It is called Good's Caustic Potash Soap No. 3. It is made by a Philadelphia firm, and it has given the best results. I mentioned this to the Committee before you came in, sir.

Q. What proportion of soap?
A. One pound of soap dissolved in eight gallons of water for plant-lice.

THE COLORADO POTATO BEETLE.

By Mr. Semple:

Q. I would like to hear you touch on the best method of dealing with potato bugs?

A. Paris green is undoubtedly the best poison, but whether that should be used in water or as a dry powder is a question that has given rise to a great deal of discussion. No doubt it is slightly more effective as a dry powder, but it is certainly more dangerous to use. Although it is more effective as a dry powder, I consider the best way is to spray it on the plants or to apply it as a liquid application, so that it cannot be blown on to the other crops, as it might be if it were applied in the form of a loose powder.

By Senator Ferguson:

Q. In large fields there would be no danger of it blowing on other crops?
A. Well, there are said to have been instances where it has blown to other crops across fences and poisoned stock.

By Mr. Calvert:

Q. What are the proportions of that mixture of soft soap and soda?
A. A saturated solution of washing soda, that is as much of washing soda as the water will dissolve, then use that liquid for thinning the soft soap. It is then about as thick as oil paint, and can be applied easily with a brush.

THE STRAWBERRY LEAF-ROLLER.

By Mr. Pettet:

Q. There was on the strawberries an insect that got into the leaf, in Prince Edward County; how was that treated?

A. That was the Strawberry Leaf-roller and it was treated with Paris green. The Picton outbreak was the worst instance of injury by this insect which has been reported to me in Canada. Last year, however, the fruit growers in that vicinity did not report any injury at all by the Strawberry Leaf-roller.

Having examined the preceding transcript of my evidence, I find it correct.

JAMES FLETCHER,

Dominion Entomologist.

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