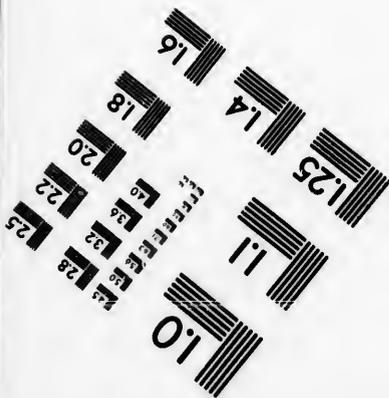
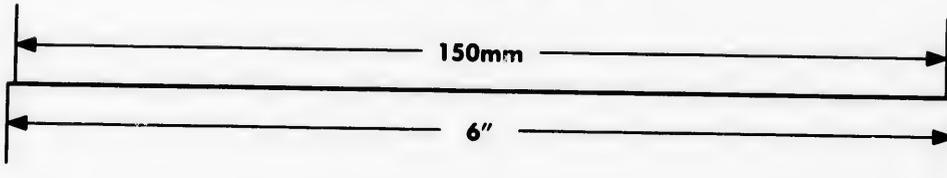
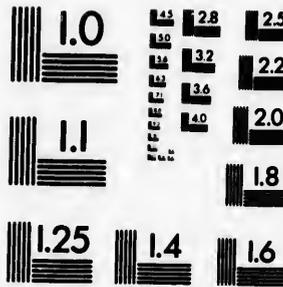
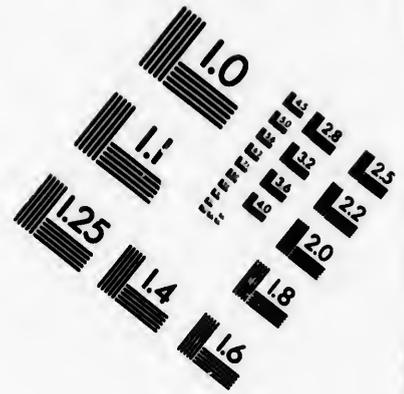
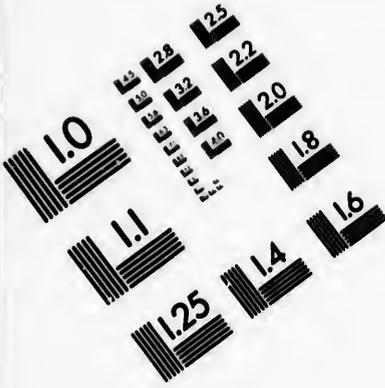


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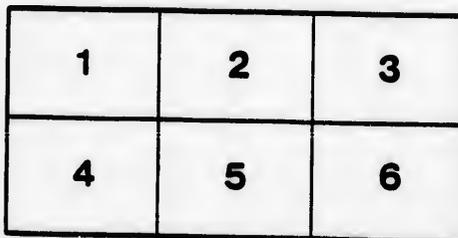
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1900

INSECT PESTS, GRASSES AND WEEDS  
—  
EVIDENCE  
OF  
DR. JAMES FLETCHER  
ENTOMOLOGIST AND BOTANIST  
BEFORE THE  
SELECT STANDING COMMITTEE  
ON  
AGRICULTURE AND COLONIZATION

1900

*PRINTED BY ORDER OF PARLIAMENT*

*As advance sheets of the Committee's Final Report*



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## INSECT PESTS, GRASSES AND WEEDS.

COMMITTEE ROOM 46,  
HOUSE OF COMMONS,  
Thursday, March 1, 1900.

The Select Standing Committee on Agriculture and Colonization met here this day at 10.30 o'clock, a.m., Mr. McMillan, Chairman, presiding.

Dr. JAMES FLETCHER, Entomologist and Botanist of the Dominion Experimental Farms, was present by request and made the following statement:—

Mr. CHAIRMAN AND GENTLEMEN,—One of the pleasant events of my year's work is the opportunity of meeting the members of the Select Standing Committee on Agriculture and Colonization. Not only is it pleasant but it is of very great value to me in carrying out the work of my department, because it brings me directly into contact with the representatives of the people from all parts of the country whom I have to serve officially. In my work it is a great benefit to learn promptly of the outbreaks of noxious insects and injurious weeds. This I do frequently through the good offices of gentlemen of this committee, and I am thus able to be of service to many who would not themselves have thought of applying for information and assistance, until the pests had made so much headway that remedial measures were too late, or at least much less effective than they might be. In no class of work is the value of prompt and definite advice of more service, than the subjects which have to be dealt with by the practical entomologist and botanist, where it frequently happens that much money may be saved by knowing what are the best steps to be taken on sudden and unexpected appearances, in large numbers, of some new agricultural pest.

As is naturally the case after many years' devotion to the study of these subjects, there is a large amount of accumulated knowledge recorded in the division, both from our own experience and from that of our many correspondents all over the Dominion, which can be utilized at short notice, to the advantage of applicants who may never previously have suffered from certain crop pests, which, although they may break out occasionally as serious enemies in certain localities, are not of regular occurrence, and, therefore, are not generally known by farmers. It is the duty of the officers of the Division of Entomology and Botany to be acquainted with these, or with the general principles founded upon their habits, by which they can advise promptly what should be done to avoid loss.

There is nothing very new in the development of the practical study of insects or plants during the last year, not already touched on or treated of in the reports of previous years; but every year there is an advance in our knowledge, not only from the accumulation of facts, as to the habits of insects and plants, but in the application of this knowledge for controlling pests. There is, I think, no branch of study in the science of agriculture towards which more attention has been directed of late years, or with more important results, than economic entomology. The practical investigation of the lives of insects which injure products of the farm, orchard and garden, with the object of discovering the best, cheapest and easiest, effective remedies.

## ERADICATION OF THE SAN JOSE SCALE.

With your permission, Mr. Chairman, I will refer briefly to some of the subjects of greater interest which have been brought officially under the notice of the division since I last had the honour of addressing the committee. Of these not one perhaps was of greater interest to every fruit grower than the work of the Ontario Government in trying to control the San José scale, an extremely injurious insect which attacks almost all kinds of deciduous fruit trees and ornamental shrubs, and with regard to which I addressed the committee at some length last year.

*By Mr. Wilson :*

Q. Has any other province been bothered except Ontario ?

A. Well, no sir, not bothered; but the scale occurred in British Columbia in two districts; steps were however promptly taken by the Government inspector of fruit pests, and it was wiped out entirely.

Q. By the local or Dominion Government ?

A. By the local government. It occurred only in a few isolated places, and the trees were at once cut down when it was discovered, which stopped the infestation. In Ontario it was a much more serious matter, because before its discovery it had already made considerable headway and there was naturally a great objection on the part of the fruit growers who did not understand the serious nature of the introduction, to have their trees destroyed, or even to go to any great expense in treating them. In one or two districts the insect obtained a foothold and spread rapidly, the fruit growers throughout the country could not be made to understand what a serious infestation this is, and consequently strenuous enough efforts were not made at first to control the scale, which is, as has often been stated, by far the most difficult insect enemy we have ever had to combat. However, after three years' experience the fruit growers of Ontario have learned its true nature, and the very men who at first maintained that the danger from this pest was unduly magnified by entomologists, and that for this reason no Act should have been passed by the Ontario Government to control it any more than many other insects found in orchards, now claim that the insect is so firmly established that it can never be eradicated, and therefore the government should treat infested trees instead of insisting on their total destruction. It was known at first that it was going to be a hard, long fight to control this scale insect, and that any measures adopted would have to be kept up continuously, if any good results were to be obtained. The Ontario Government was hampered by public opinion, from the beginning, and finally during the past summer had to relax their wise efforts in behalf of the fruit growers and give up the plan which they had at first adopted of destroying all trees found to be infested by the San José scale.

I have recently read in the newspapers that the provincial Minister of Agriculture is now going to allow fruit growers to treat their trees instead of having them destroyed by the government. This is in response to widely expressed opinion that the fruit growers do not wish him to persist in carrying out the drastic measures which he had adopted for the eradication of the scale—measures which I believe, from all we know of the nature of this enemy, were the proper ones for him to have adopted if control of the insect was to be secured—but governments, of course, are not like ordinary individuals; they merely represent the people and have to bow to public opinion when this is found to be the will of the majority concerned.

Q. These measures were to destroy the trees ?

A. Yes, the destruction of all infested trees. I think if that step had been taken at first and had been adhered to strictly, this insect could not have spread because it was not widely established, and the Federal Government soon passed the San José Scale Act, of 1898, which has been stringently enforced. Therefore, no now infestation was possible, and, though statements are made to the contrary, I do not believe there has been any fresh introduction of the scale on infested nursery stock from the United States. Of course, there are always some people

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who will risk the penalty and break any law; but there has been very little smuggling in this connection. That is a general statement which I believe to be accurate. Both the Federal and the Provincial San José Scale Acts have had some opponents from the beginning, but it was a matter which the Governments had to consider for themselves, and they did what they thought wisest, after considering the matter as carefully as possible. After this it is probable that some measures will be adopted in Ontario by which fruit growers will be allowed to treat their trees themselves, and every one will then have to take his chance as to what losses he may suffer from this justly dreaded insect.

By Mr. Sprault:

Q. By spraying?

A. Yes, chiefly by spraying, also by fumigation with hydrocyanic acid gas or by treatment of the trees with crude petroleum, which is claimed to be a sure remedy. Unfortunately many of the remedies which have been claimed to be so when tested. First, there was the ordinary kerosene emulsion, made from coal oil and soap suds, which it was claimed would destroy the San José scale, and it will if put right on every insect, but this insect is so exceedingly minute and it quickly covers the trees so extensively that it is difficult to treat trees thoroughly. What is necessary is a practical remedy, that is, one which will accomplish what is claimed for it, and which can be applied easily and at a cost which will not exceed a reasonable value of the tree to be saved.

Now, with regard to the danger from the San José scale, I have often said, and still maintain, that this is the most difficult insect we have ever had to contend against. It is extremely small, and when in small numbers most difficult to detect, and even when occurring in large numbers, a general appearance of grayness on the bark is the only indication of its presence, to those who are not acquainted with it, and it is thus easily overlooked. The scale must be present in very large numbers to thoroughly change, or even to a slight degree, the colour of the whole tree. Again, it breeds very rapidly, so that from a single fertile female there may be born in one season the incredible number of three thousand millions. This marvellous power of increase, and its inconspicuous nature, render it a task of the greatest difficulty to control it, because if a fruit grower who finds his orchard infested hesitates for only a short time as to whether he will treat his trees or destroy them outright, the insect may spread to other trees or other orchards adjoining his own. In the United States the San José Scale has spread with great rapidity during the last two years. This was largely owing to the Spanish-American war, during which many matters of only domestic interest were left in abeyance till that, as it was thought, much larger issue was disposed of. In many states this resulted in drawing off attention from proposed legislation looking to the control or eradication of the San José scale. Many states now find that the insect has spread very much indeed, among their orchards, and they now have to do what the Ontario Government is going to do, namely, allow fruit growers to treat infested trees, in short, to make the best of a bad job. In some states the fruit growers say that treatment by the legislature is not practicable owing to the extent to which the scale has spread. This, what is claimed by many, is also the case in Ontario. They say that the pest is now so firmly established that it would be such an enormous expense to treat it, or to destroy the trees, that it would be unjustifiable; now however, as the fruit growers themselves are responsible for this state of affairs, having taken the matter into their own hands, they must accept the consequences, whatever these may be. First of all they persisted in buying nursery stock from states which were known to be infested; then tried to belittle the danger of allowing this insect to be introduced and finally have insisted on the Provincial Government relinquishing its efforts to control it and save them and the country from loss. It seems hard, however, that those who tried strenuously to do what was best and right in controlling this pest, should have to suffer from the ignorance, supineness, or carelessness, call it what you will, of others, who had not suffered; but that is frequently the case.

Every effort has been made by entomologists to put before the public the best means to adopt in order to subdue and control this insect, and we have endeavoured to make known what an exceedingly dangerous insect it is. Nothing we have learned about it up to the latest moments justifies us in considering it other than a most dangerous and much to be dreaded enemy.

By *Mr. Clancy* :

Q. Is it not a fact that trees in the forest generally are infested as well as fruit trees?

A. No, certainly not in Canada.

Q. Well it is broadly stated that basswood and some other kinds of forest trees are affected?

A. The statement that they are generally affected is entirely unfounded. I have never found it or seen it in Canada on forest trees, and, even in New Jersey, the only state where it is stated to have spread to the forest trees, it has been discovered in a few localities only. It was stated two years ago that the forests in New Jersey were so badly infested that there was no chance of ever eradicating the scale. This on examination was, I am told, found not to be the case. In Ontario this is certainly not the case. Mr. George E. Fisher, the Ontario Government Inspector of San José scale, who is a very efficient officer and a conscientious worker, has carefully and frequently examined trees close to infested orchards, and up to the present has not been able to discover the pest in any instances on forest or shade trees.

Q. Who is he?

A. He is a practical fruit grower living at Freeman in the Hamilton district. He has been known for many years as an expert and successful fruit grower and I believe is now from his experience, one of the best experts we have in Canada, on the San José scale; for the last two years Mr. Fisher has studied the San José scale in Ontario's orchards with great assiduity and being also a good microscopist he has studied the insect in all its stages of development and is now undoubtedly one of the best authorities upon the subject in Canada. Mr. Fisher tells me that he has not found the scale on forest trees; still of course, if neglected, it will in time spread to them and then little can be done to check it except in orchards. It has been found to be characteristic of many imported insects that where they feed on one class of plants it generally takes them a long time to spread from that class of plants to others even where these are closely allied with the cultivated forms. Not only is this the case, but frequently an insect which feeds in one place chiefly on one kind of tree does not do so in another. As an instance of this, the two kinds of tent caterpillars which destroyed the aspen poplar groves along the Ottawa, and left them as bare as poles in June last, were found in many places in the province of Quebec to be most destructive to the sugar maple trees, while here, even when the maple trees were growing among the poplars, they were not attacked, and in most places the red maple was left untouched as long as there was anything else for them to eat. There are aberrations in the habits of all insects of this nature, which we cannot explain. The same insect in one place will feed on one tree and in the other upon quite another. The same thing applies to an insect when it is introduced into a new locality. It very seldom spreads, for some years at any rate, to any other class of trees, even although that class of trees may in another district be attacked by it. It was hoped that the information we could gather from the large amount of published accounts of the depredations of the San José scale in the United States, and the different trees attacked, would allow us safely to exempt from the list of trees usually imported from the United States, many that were useful for ornamental purposes and had not been attacked by the San José scale; but we found that almost every woody-stemmed deciduous tree and shrub was attacked, and, therefore, we had to include within the provisions of the San José Scale Act, all trees except those of the pine and orange

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families. There has been no instance recorded of this insect attacking the different members of the pine family. This however, did not, as some have thought, allow of the importation of all kinds of evergreens, because there are many kinds of evergreens which do not belong to the pine family. The question as to whether or not the San José scale had escaped from the orchards and become prevalent in our forests was one of considerable importance, because if this could have been proved, the drastic and offensive measure of destroying infested orchard trees, could have been done away with, for, if the scale were so thoroughly established in Canada that there was no hope of controlling it, there would have been no use in cutting down affected trees. But that is not the case, and more than that, this pest is still restricted to a comparatively small part of the province of Ontario; the Provincial Government has made enormous efforts to control it and has done excellent work.

#### MIXTURES FOR SPRAYING,—CARE IN USING THEM REQUIRED.

The effect of the new provision allowing the spraying and treating of trees cannot be anticipated; but the study of the application of remedies and the development and improvement of the remedies themselves have gone on steadily improving, until now they are all materially changed from what they were two or three years ago. Many new materials have been recommended recently in the way of poisonous applications, mostly of arsenical applications for the destruction of foliage-eating caterpillars. Among this class of insects, the Tent Caterpillars are just now of special interest to many; these are the caterpillars already referred to, which for the last three years have been extremely abundant all through the Maritime Provinces, Ontario and Quebec and with an allied species in the Prairie Provinces and through British Columbia. Up to the present time, for various reasons, I consider this well known material, Paris green, is the best of the poisonous applications to recommend. Several poisons have been studied carefully at some of the experimental stations during the past year, and have been reported on and recommended in the bulletins of those stations. Paris green is a chemical combination of arsenic, acetic acid and copper. Green arsenite is similar without some of the ingredients of Paris green, which allows it to be produced at less expense. Then again there is arsenate of lime, gypsum, &c., &c., all of which have their advocates; some of these will probably be largely used instead of Paris green. Paris green a new proprietary remedy which has been lately introduced, differs from Paris green in the absence of acetic acid, and has been found useful; it is also much cheaper than Paris green.

#### DANGER FROM SUBSTITUTE POISONS.

But with all of these there is still a certain degree of uncertainty or danger. I do not myself consider it desirable as yet to substitute any article for the well known cheap and effective remedy, Paris green. It is so well known to every one, which is a great advantage in making a recommendation; it is to be obtained anywhere; it is perfectly effective; it gives warning by its green colour which at once declares its poisonous nature; and I see no reason yet to change the recommendation of Paris green for all foliage eating caterpillars or insects. As I have said, its use is now so well known that there is no difficulty in getting fruit growers to purchase and use it; there is very little danger of it being mistaken for other substances, and as a consequence I find that during the past few years there have been very few accidents from people mistaking it for other things, such as the various food products. If we were to allow the substitution for this of some other material not as well known, and of a white colour, such as white arsenic, there would be for a long time danger of many serious accidents. We can never hope for the large number of fruit growers and farmers who use insecticides, for that degree of necessary care which everybody

who uses poison should take. I am convinced that any white material such as white arsenic, would be far too dangerous to recommend for wholesale application, and as we have such a cheap and effective remedy as Paris green, for the present at any rate, I recommend it for general use. Undoubtedly even Paris green is used in much greater strength than is usually necessary; or than it is safe to apply to the foliage of many trees. One pound with one pound of fresh lime in 200 gallons of water, is all that is necessary for most insects, if used when they are small.

THE TENT CATERPILLAR,—WHEN AND HOW TO TREAT IT.

By Mr. Clancy:

Q. Will that kill the tent caterpillars?

A. Yes, when they are small; but unfortunately most people do not notice them when they are small. It is only those who know their habits that are on the lookout for them at the proper time, when they first hatch. The tent caterpillars hatch from eggs in the last week of April. The eggs are laid in July, and within a month the young caterpillars are fully formed inside the eggs, although they do not emerge from the eggs until the following spring. The warm weather of spring revives them when they eat their way out of the shells and attack the buds as soon as they burst.

By Mr. Macdonald, (Huron):

Q. What is the proper strength to kill the potato bug?

A. The potato with its coarse leaves is able to resist injury better than some other plants, and one pound in a hundred gallons of water is not too strong. If an equal quantity, or better, if double the quantity of fresh lime is put in the water this neutralizes the arsenious acid and reduces very much the danger of burning the leaves without lessening its poisonous properties. I always now recommend that an equal or double the quantity of fresh lime should be used with Paris green and then there is little danger in using it on all foliage. When the young tent caterpillars first hatch they are much more easily destroyed than when they become larger; but usually people do not notice them till they are larger and then they are not so easily destroyed. This is the reason that you hear people say that Paris green will not kill the tent caterpillar. It will however; but if the caterpillars are allowed to grow to half their full size they are much harder to kill, and in order to make the mixture strong enough to kill the caterpillar, you run the danger of killing the foliage also. The use of lime in the proportion of one or two pounds to a hundred gallons of water prevents injury to the foliage. Last season the tent caterpillars were very bad in many districts, and, in some cases, whole districts were overrun. In the Quebec province their attacks on the sugar maple-groves have given rise to much anxiety, and many letters have lately been received asking if sugar bushes which were stripped of their leaves last year can be used for tapping this season. I judge that the ravages were more serious among the sugar-maples than upon any other trees, except perhaps apple-trees in orchards. The tent caterpillar is not really a very hard enemy to fight and there is no reason at all for those who grow fruit trees in orchards, allowing them to be destroyed by this pest. Last year I was in many of the infested districts and I saw many careful fruit growers who saved their trees by strict attention to spraying at the proper time. Moreover, this same strict attention to spraying paid them very well indeed in the returns they got from their orchards. The labour and first expense of spraying should not be considered at all; what a fruit grower should consider is the question, whether the cost is commensurate with the proportion of profits. Some remedies pay better than others, and that remedy which pays us best is the one we should adopt. When a remedy is recommended I am frequently told that it costs too much. That is a very mistaken idea, for nothing costs too much if you make money out of it. Few in this country farm for amusement; most want to make money out of it. No matter how much a remedy may cost, it pays to use

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it if it gives a satisfactory margin of profit. I do not mean by margin just a bare profit, but good results. It certainly paid those fruit growers I have referred to, to spray last year, for they not only kept their orchards free from insects but got from the operation better apples and better prices than their neighbours.

By Mr. Cochrane :

Q. What time do you recommend spraying for the tent caterpillar?

A. You cannot recommend any special date for every year, but when the tent caterpillar is abundant, as abundant as it was last year, I would spray as soon as the young caterpillars are seen on the trees; about the beginning of May would be probably as near to a general date as could be given; at any rate before the flowers open.

Q. As soon as the leaves are out?

A. Yes, just as soon as the leaves begin to expand. About the 15th to the 20th of May may be taken as an average for the appearance of blossoms, when spraying must stop for a time. I say 'spray before the flowers open, because the bees are of great benefit to fruit trees by fertilizing the flowers, and bees will be certainly killed if the spraying is done when the trees are in blossom.' The question was brought up by the Pomological Society of Quebec at its recent meeting last winter, whether they could not get a provincial Act like that in force in Ontario to prevent spraying while trees are in blossom for the protection of the bees and the fruit growers, because it has been proved that bees are certainly killed by poisons applied after the flowers open. There is no insect we know of for which the trees actually require to be sprayed during the time the trees are in blossom. Paris green is caustic and falling on the pistil—the only part of the flower where there is no epidermis—proves very injurious. Spraying with Paris green therefore when the trees are in blossom is harmful to the blossoms from the liquid falling on the viscid stigmatic disk of the pistil. This is the central portion of the apple flower and is very delicate.

#### REMEDIES FOR TENT CATERPILLARS.

The general remedies for tent caterpillars are, first, the collection of the eggs in the winter—of course I speak now of orchard practice. There is no practical remedy for the trees in forests where you could not get at the eggs laid high up on large trees, but in orchards, in the case of most fruit growers, the collection of the eggs during the winter when the trees are being pruned is a remedy of great practical use. All these insects have definite habits, and when you know these you know, in many instances, how to fight them to the greatest advantage. The rings of eggs from which the tent caterpillars hatch contain about 200 eggs and will be found a few inches from the ends of the small twigs. After finding half a dozen nests or so any one will learn to recognize them easily, and at a glance will be able to tell whether there are any egg clusters on a tree. Boys and children who, as a rule, have very sharp eyes will be found of great assistance in finding these eggs. I would not recommend this remedy for those who spray their trees regularly, for by spraying early all this labour is rendered unnecessary. But as there is unfortunately not one in half a dozen who does spray as a regular practice, the collection of the eggs in winter will be found very useful for most people. After the eggs are hatched, spraying with Paris green is the best remedy. If neglected they soon grow large and strip whole trees of their leaves; they then leave the trees they crawl along fences or paths and seem to be particularly fond of walking along railway tracks. This accounts for the stories of trains being stopped, which stories are quite true but it does not take much to stop a train. Trains have been occasionally stopped by weeds and insects, and for the same reason, a few tent caterpillars crawling along the rails will be enough to prevent the wheels from gripping, but the accounts of the great depth of tent caterpillars along the tracks by which trains have been stopped are

probably enormously exaggerated. I can quite understand that a comparatively small number of tent caterpillars walking close together along the rails, when crushed by the wheels, would speedily prevent a train making good progress. When these caterpillars wander they are in search of food, and that is a practical point for us to know about them. If you have taken the proper means to preserve your orchards and have kept them clear of insects, your trees are covered with foliage in good condition, so you may expect that they will come to you. Therefore you must take means to protect your trees from caterpillars which will come from outside and crawl up the trunks. Some of the simple mechanical contrivances are of great use. One of these is an inverted cone of wire netting which is placed around the tree, and when the caterpillars climb up they are kept there and do not seem to have sense enough to crawl down to the edge and crawl up the outside of the cone, but they gather together in masses beneath it. This will prevent them from getting up long enough to allow the fruit grower, who is on the look out, to destroy them. A syringe with coal oil is a good instrument for this purpose. Another plan is to use bands with some viscid material, such as a mixture of castor oil and rosin. These have been used with good effect, for when the caterpillars reach this band painted on tin, cardboard or paper, they either get caught in the viscid mixture or will not crawl over it.

*By Mr. Sproule*

Q. I saw farmers using wool with tar on it 30 and 40 years ago.

A. Yes, or what is less dangerous for the tree and is a very good method is to tie a band of cotton batting around the tree, as it stands out loosely and the caterpillars cannot crawl over it.

Q. Wool is better than cotton, as the cotton sags and is soon matted; wool is undoubtedly the best.

A. Yes, that would be better. I never saw wool used, but it would probably be better than cotton batting, which would need to be kept teased out. Every one knows these remedies, but the trouble is they do not use them, so their trees become infested and they lose a large percentage of their crop. About the time these pests are due to appear, we send out articles to the newspapers, little squibs, and the papers are glad to publish them. Still I must go back to my first statement that the damage done by injurious insects is due to the fact, not that people do not know the remedies but that they put them into operation too late or not at all. It is a prompt application that is effectual.

#### VALUE OF SPRAYING.

Occasionally we find new insect enemies, either new altogether or new in the sense that they are extending their range to the Dominion from some other country and these introduced insects are frequently the worst pests which attack gardens and farm crops. Injurious insects have now been studied sufficiently for us to prevent attack or minimize the injury, so that it may now be said that in almost all instances something may be done to reduce the loss. The operation of spraying is now so well known and adopted so generally by wise fruit growers and other farmers that it is not worth while taking up the time of the committee to-day with it. Every sensible man and every good business man now knows that for certain crops you must spray. The apple grower knows that to get clean, whole, sound fruit, he has to spray. Systematic experiments have shown that we can save 75 per cent of our apples by spraying at the proper time. In fact all fruit crops can be increased by spraying at the proper time. All these facts are now known and can be found in the reports of this committee, in the experimental farm reports, or in the spraying calendars; so, there is no excuse for any one in Canada who wants to know how to protect his crops or to cope with many pests which they may know, or even with those which they may not know; for they can get information easily, which will enable them to fight in the best way most of their insect enemies.

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The operation of spraying has of course developed within the last ten or twelve years; but it is now so well known that thousands of spraying pumps are sold in Canada every year. Every fruit grower knows that he has to attend to this operation the same as he has to pruning and to fertilizing the soil. Take for example the potato beetle. Every farmer now knows that this insect belongs to a certain class of leaf-eaters for which we have a general remedy well known to all, viz., an active poison like Paris green applied to the leaves and eaten with them. Then we have special remedies for special pests and these can be got only from one who knows them from special study; but the people of Canada are employing specialists to work these out for them and they know that these can be got by writing to us for them.

## SAN JOSE SCALE,—REMEDY FOR FUMIGATION.

*By Mr. Clancy :*

Q. Is there any remedy found to be a preventive of the San José scale, considering the difficulty of reaching it? Would you recommend Paris green?

A. Not for the San José scale which is a sucking insect. The scale insects must have some remedy applied which destroys them by direct contact with their bodies. The remedies are of two kinds: either a viscid remedy such as oils which will run all over their bodies and suffocate them by stopping their breathing pores, such as petroleum or the various emulsions of kerosene or the lately recommended crude petroleum, now considered one of the best remedies. Another method is suffocating with gas such as hydrocyanic acid gas, which terribly poisonous gas is liberated by the action of sulphuric acid on cyanide of potassium and water. Thus is generated an exceedingly poisonous gas to all animal life. When dormant plants are exposed to this gas for 45 minutes it does not injure the trees but entirely destroys the scale.

Q. That is not quite my question. What I asked was, in view of the difficulty that has been found with these applications, have such been found effectual in destroying the scale, always considering the means we have of treating them?

A. Yes. The hydrocyanic gas is perfectly effective when applied in the proper way and by specialists. It is a difficult matter, but any matter of difficulty may be overcome. In California and many other places where there have been serious visitations of these insects this gas has been applied with good results. Prof. Johnson of Maryland, who perhaps has had more experience with the gas treatment than anyone else in the United States, has had tents made by which he can cover over the whole tree. He generates the gas inside the tent and has met with perfect success, but this method is expensive and dangerous.

Q. I am asking this question for information. Can you suggest a remedy that the farmers can apply themselves?

A. No, I do not think there is any remedy that the ordinary farmer can be trusted to apply without danger to his trees or to himself. The hydrocyanic acid gas is so intensely poisonous that it cannot be recommended for general use. On a recent occasion, the rolling stock of a railway in South Africa having become thoroughly infested with bed bugs, it was decided to fumigate the cars with this poisonous gas. They closed up the cars, put in the acid and cyanide and left them shut up closely. Within an hour everything inside the cars so treated is dead. It is of course necessary to watch carefully that no one goes into these cars.

Q. I presume that application of this gas by farmers, considering the cost, would have to be abandoned?

A. I do not know that. I would not say that it would have to be abandoned, but that it cannot be adopted as yet; that is the point I think. Bisulphide of carbon is now largely used by pea merchants for killing the Pea-weevil. By knowing what has to be done and doing it, the men who are handling it gradually obtain that skill and method which enables them to do it without danger; and now the ordinary

farmer knows that if his peas are infested with weevils he simply procures a coal oil barrel, puts his infested peas in it, puts some bisulphide on the top, closes it up tightly and leaves it for two or three days and the bugs are killed. Many farmers know this, but they do not all practise it, and consequently the Pea-weevil is still very destructive. The stand I have taken about the San José scale is that we have not yet got a practical remedy which the ordinary farmer of the country can adopt.

*By Mr. Cochrane :*

Q. If that is a perfect cure, I look at it this way: supposing I had an apple tree worth so much, and this remedy is perfect. If you could apply it, the remedy would not be as expensive as it would be for me to cut down the tree?

A. No, but it would be exceedingly expensive for you and your neighbours to have an accident or to try a remedy that failed.

Q. I am not talking about that, but I understood you say that there is a remedy which is costly and would not be safe for farmers to adopt, but is safe when properly handled?

A. Yes, that is true. But everybody in the district suffers if the pest occurs there at all and spreads.

*By Mr. MacLaren :*

Q. Are there specialists who could apply it safely?

A. There are not enough specialists in Canada to do all the work. The Government of Ontario has had to allow the treatment of trees and the country may have to suffer for it. There are a great many things that have to be considered, and there are a great many difficulties that have to be overcome. The treatment of trees is not so easy as it looks, and my only reason for saying what I have said this morning is that I do not want disappointed people afterwards to say: 'You gave us a remedy for the pest, that was no good and hundreds or even thousands of trees have been destroyed by being cut out that could have been saved if treatment had been allowed.' We have done our best and pointed out the dangers.

*By Mr. Cochrane :*

Q. How far east has it got yet?

A. Not quite to Toronto.

#### TREATMENT ACCORDING TO CLASS OF INSECT,—GREENHOUSES.

I was speaking a few minutes ago of the different kinds of insects, those which bite and those which suck their food. Those that bite can be killed by placing poisonous matter on their food. Those that do not bite their food,—such as the San José scale, which is provided with a very minute tube through which it sucks its food in a liquid form, must be treated in a different way. The most useful substances for treating these are oils, such as kerosene and emulsions of it, which suffocates them, also poisonous fumes or gas, bi-sulphide of carbon, when rendered gaseous, and hydrocyanic acid gas. Fumigation with this gas has been experimented with at Washington, very carefully, during the last two years, and has been found to be the best remedy for use in greenhouses where many insect pests are sometimes found. The business of growing plants in greenhouses is now becoming in Canada a very important industry, and as plants when grown under glass are not subject to many accidents which may occur outside, they are frequently attacked seriously by various insect pests, and are very difficult to treat on account of the delicate nature of many of these plants.

It has been found that the treatment with hydrocyanic acid gas is valuable for greenhouses. When it has been learnt by experiment what strength of gas the

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different plants will stand, it is only a matter of calculating the cubic contents of the greenhouses and then giving the proper quantity which can be used with safety. There is probably a remedy for every insect known, but the difficulty is to get a practical one to destroy them at a reasonable cost without injury to the plants.

Fumigation by hydrocyanic acid gas has been applied so successfully in treating greenhouses that very much is hoped for from the method. The large violet houses which in many parts have been established in Canada and become an important industry are liable to become infested by an insect which has done much harm in the United States and has also occurred in one of our Canadian houses. This is the Black Violet Aphis, which is very difficult to treat, because the violet is a delicate plant which will not allow the application of many remedies used for hardier plants. But by the use of this gas we can now destroy this and all other insects in greenhouses. The gas is applied with care, then the windows are opened to let the gas escape as soon as its work is done and before the plants are injured. The great danger, as I have said before, is its exceedingly poisonous nature.

I began to tell you, but was drawn away from the subject by a question, about the fumigation of a train in South Africa which had become badly infested with bed-bugs, this will illustrate how intensely poisonous this hydrocyanic acid gas is. A Kaffir tried to go into the train to take a sleep, and when the custodian was not watching for a moment, the Kaffir jumped up on the platform and tried to enter the car, he merely opened the door and had not even passed the door when he fell unconscious and it was two days before he got over the effects of inhaling the fumes; so you can see that this gas is most intensely poisonous. Another name for hydrocyanic acid gas, is prussic acid, a better known name for this most deadly poison. Notwithstanding all this, it is a practical remedy in the hands of specialists. I lay stress on this, because if we are to recommend a remedy for use by everybody every feature of the case has to be borne in mind, or some accident may happen or injury may be done to trees.

#### RECENTLY APPEARED INSECTS,—THE PEA LOUSE.

I have said that there were few new insects to report upon this year, nevertheless there are one or two which I should like to mention on account of their importance. The destructive Pea Louse. The pea crop this year was seriously infested by one of the plant lice, and it is a remarkable fact that this was an insect which never before had been observed in sufficient numbers to attract the attention of specialists; so we had to deal with what we call a new species, extending from the maritime provinces in the east to western Ontario, and north and south from central Ontario to the southern states. The damage was enormous among the pea fields further south, and in Maryland alone it is estimated that the loss was \$3,000,000. Now, the pea crop alone is not a big one compared with other crops, and when it is found that the loss in one state, and in this one crop, was as large as \$3,000,000, it shows the amount of injury sometimes done by insect pests. We had this destructive pea aphid in Canada, but not to that extent, though many crops were reduced to half what they should have been. The question naturally arises, are we likely to have it again next year? From what we know of plant-lice, I doubt this; and I do not think there is need for serious alarm regarding next season's crop.

By Mr. Cochrane :

Q. How does it affect the crop?

A. It sucks the sap from the pea plants and they die.

Q. As though the drought had struck it?

A. Yes; it was thought by most people that it was the drought which caused the injury, but when they went to look at the plants they found them covered with green plant-lice. One fact which makes me think that this pest will not be serious this year is that so many parasitic insects have been found accompanying the plant-

lice. In some places this pest was so badly infested with parasitic insects that on one farm in Maryland the farmer gathered up twenty bushels of green worms when harvesting. These were parasites of the plant-lice. Each one of these worms would require many scores of plant-lice for a meal, so that I hope we need not have much fear of many of them being found next season. In Canada we have also several kinds of those parasites, and doubtless owing to their good work there was not so much damage as further south. Not only was this pest found in the open field, but it was very bad in gardens, and I think there were with us more complaints from growers of the flowering sweet peas than from farmers. Farmers are apt to take an outbreak like this as a calamity which has no remedy, but to grin and bear it, but gardeners have not to complain of such pests so often, and therefore there was more complaint heard from them.

#### TREATMENT FOR PLANT LICE.

Those who grow flowering plants and looked after them very carefully were very much troubled and were sending frequently for remedies. The ordinary remedies for plant-lice we found to be perfectly effective for these, and the simplest remedy for plant-lice is whale-oil soap, now a well known remedy for this class of insects, in the proportion of one pound in six gallons of water. This remedy is rather expensive, and except for garden or orchard work is not perhaps a practical remedy. I should have mentioned, when you asked if there were any practical remedy for San José scale, that the preparations known as whale-oil soaps are merely fish oil soaps made with potash after a definite formula. Those soaps made by W. H. Owen, of Catawba Island, and the J. B. Good Company, of Philadelphia, are good soaps, and the use of these if done as recommended becomes a practical remedy. The proper quantity to use is two pounds in one gallon of water. When bought in large quantities these soaps are not very expensive—about four cents a pound, but even eight cents in one gallon of water will be thought by many to be a very expensive remedy when it has to be applied to large trees. If the soap has been properly made with potash, it is not too thick for spraying when diluted, and can be applied with a spraying pump. It is also claimed to be beneficial to the trees. Trees which have been sprayed as a general experience showing greater vigour. This is due to the amount of potash which they receive in the soap. The insect can be almost entirely eradicated with this spray. If two or three applications are made the trees will be fairly clean of scales and much improved in appearance.

An insect which has not yet given us much trouble in Canada, but which fruit-growers in the province of Quebec must expect to be troubled with before long, is the apple maggot, which is very prevalent in the states of Vermont and Maine. It is a worse pest for the apple-grower than the codling moth, the caterpillar of which attacks the apple chiefly at the core and then only eats its way out, leaving much of the apple uninjured. The Apple Maggot is the maggot of a fly which perforates the apple and pushes her eggs inside the flesh of the apple. From these eggs maggots hatch soon after, and eat their way through the apple in every direction, spoiling it utterly. There is no remedy which we can apply as a spray to reach this insect. The remedy which has given the best results is collecting the infested fruit after it falls to the ground and destroying it with the maggots inside it, so that they do not mature to destroy the crop of the next year. The most profitable method of destroying this fruit is to keep sheep or pigs in the orchard to eat up all windfalls as soon as they fall, and in seasons when the crop is small this remedy is very effective. When the apples are not abundant the animals all run to the spot as soon as an apple falls and pick it up immediately. The collecting by hand and destroying it in some way sounds easier than it turns out to be in actual practice. When there is a small crop it is easily destroyed, but in years when there is a large crop nothing is done, and consequently there is a large increase in insects the following year. It is sometimes thought and claimed that in a season when the crops are small it is not worth while treating orchards, but that of all seasons is the time to treat them most carefully, because if you can keep your apple crop clean when it is small, you will get a much

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higher price than in an ordinary year, and if you take pains to spray it, for the codling moth for instance, and by so doing produce fruit in a perfect condition, you will have a much more valuable crop than your neighbours, who, on account of the small crop, do not think it worth while to go to the trouble and expense of protecting it and consequently get nearly every apple destroyed or injured by this insect. Therefore, when there is a small crop, everything should be done to produce it in the best condition, so as to obtain the highest market prices, and by so doing and on account of this work a better crop is insured the next year.

The apple maggot ought to be known to all who are likely to suffer from it, and for that reason I have put illustrated articles on it in the annual reports of the experimental farms. The apple maggot has spread up into Canada from the United States to the south of us. There have been several instances of injurious insects gaining access to Canada in this way. That is they have been first introduced there and later have spread to Canada, but while we suffer from this disadvantage, our American friends give us also the great advantage of their special study of all these insects and pests. The United States is undoubtedly the most advanced country in the world with regard to the application of science to the ordinary matters of life. They have developed to a high point the economic study of the habits of insects, and it is very seldom we get from the United States any insect without being able at the same time to get from their official publications the best information available for the controlling of that insect.

#### PESTS THAT INFEST CATTLE,—TREATMENT OF

An instance which occurs to me now was the cattle horn-fly, which a few years ago did so much injury by attacking our cattle and reducing the yield of milk and beef. As soon as this insect appeared among us, knowing it was spreading from the United States, we were prepared for it, and the best remedies known were used at once and were found effective. The live stock interest is of course one of our most important resources in Canada, and the importance of protecting the animals from injury by parasites is very well known. Every practical farmer knows that he must expect in keeping stock, even with the best of care, occasionally to have some of his animals lousy, and a subject of frequent inquiry is: what is the best simple remedy? Probably seal oil with a little sulphur in it is as simple as anything which can be recommended, or 1 part by weight of powdered sulphur to 5 parts of lard. Kerosene emulsion we have also found excellent. There is no lack of remedies; the chief trouble is they are not used. It is only the men who are in earnest in their work that succeed; such men are all the time writing to know what they should do, and they apply the remedies when they learn them. The careful stock owner keeps his herds clean, and in consequence both he and they are very much benefited by it. At this time in the year the warbles in the backs of cattle are beginning to show. These are the large maggots found in tumours beneath the skin of cattle; they originate from eggs laid by a large fly during the previous summer. At this time in the year the swellings on the back are beginning to appear. The presence of these disgusting parasites is very injurious to the stock owner and most painful to the animals. They can be best destroyed at this time of the year. By feeling along the backs of the animals the lumps can be detected, and the maggots should be destroyed by placing on the lumps a mixture of lard and sulphur, rubbing it in well, and leaving a little lump of it on the small central hole which will be found at the top of the swelling and through which the maggot breathes. There are many mixtures which may be used, but I think that is the simplest effectual remedy. The maggot wastes away, the wound heals up and the skin is not injured. Like all other remedies, if applied early it is most effectual and the loss is least.

*By Mr. Cargill:*

Q. What is the remedy for the Horn Fly?

A. The simplest remedy is a mixture of pine tar and lard in the proportion of one part to ten. We have used this here for the last four years and the cattle were

treated in the pasture by the herdsmen putting a little on each animal when the fly was most troublesome, and the annoyance soon stopped. It was put on with a cloth and rubbed down the neck, chest, back and loins. For bulls which are shut up in the stalls we found it simpler to spray them with coal oil emulsion, a mixture of coal oil and soapsuds. This is on the whole better than the tar, but it is not a nice thing to make and we find many people prefer to use pine tar and lard.

*By Mr. Cochrane:*

Q. I don't know how expensive it may be, but I have very often seen pine tar used on calves.

A. Do you not mix it with lard?

Q. I just buy a little tin of tar and use it with a swab on the end of a stick.

A. It is more easily put on when you mix lard with it and just as effective.

Q. Yes, but spraying is not so effectual?

A. Your remedy would be more expensive and more trouble, and would mat the hair together more than the other does, which would make the animals uncomfortable as well as look very dirty.

#### THE PEAR-TREE FLEA-LOUSE,—TREATMENT OF.

An insect which should be better known and which has been treated of in the experimental farm reports is the Pear-tree Flea-louse, a small flea-like creature not very general in Canada as yet, but which should be known by fruit growers. This is one of the insects which passes the winter beneath the flakes of bark on the trees, but only on the pear tree. Where the trees have rough bark it is a good method to scrape it off with a sharp hoe not only to make the orchard look neater, but to prevent insects from passing the winter there. This should be done during winter over canvas spread at the foot of the trees. The insects are of course all torpid then and it is not so much trouble to exterminate them as in the summer.

*By Mr. McGregor:*

Q. Has your attention been called to orchards which look all right but won't bear fruit? A man in my section has a beautiful orchard with magnificent trees, but he has never been able, with all his attention, to make it produce fruit?

A. Perhaps his trees are all the same variety?

Q. No; I think he has thirteen varieties.

A. We now know that with some varieties of fruit trees there are some which cannot be fertilized with their own pollen. This is especially the case with plums. I have heard of some cases where the trees proved absolutely barren, or, at any rate, could not be fertilized with their own pollen. This is the case, to a large degree, with pears, and also, to some extent, with apples. As you say, however, that there are other varieties in the orchard you speak of, that theory will not explain the difficulty. I think if you ask Mr. Macoun, the horticulturist; he has had that matter brought before him. There was one orchard near Windsor and one in Quebec which I heard of lately where no fruit could be obtained, but in these cases, I think the orchards consisted of one block of apples of the same species, but that is not the case here. I will speak to Mr. Macoun about this and ask him to speak about that matter when he comes before the committee.

Q. Does the soil have anything to do with it?

A. No; an unsuitable or sterile soil would have the effect of throwing the trees into fruit. A very fertile soil, on the other hand, would induce a growth of leaves and branches. When a tree is placed under adverse circumstances, it endeavours to overcome these in a special way, viz., by throwing all its energy into the production of flowers and fruit, so as to save itself from extinction. This fact is taken advantage of by horticulturists when propagating new fruits. A large number of seedlings are grown from seed, of which only a very small proportion will be found to produce

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fruit of a sufficiently good quality to make it worth while to save the trees. Their quality cannot be judged until they come into bearing, and frequently this is not until after many years of care. It is a common practice, however, to force these seedlings into bearing at an earlier date than would be the case under ordinary circumstances, by pruning the roots severely. This has the effect of checking the growth, and the trees, in trying to save themselves, produce flowers and fruit. I would merely suggest that your friend might find it advantageous to try this experiment and prune the roots of his trees.

#### THE OYSTER-SHELL BARK-LOUSE,—TREATMENT OF.

A destructive insect which has been too well known for over 100 years and yet with regard to which we have yet something to learn, is the Oyster-shell Bark-louse. With the exception of one or two small areas, this insect is abundant everywhere. It is a rather inconspicuous insect and, while it does not bear comparison in this regard with the San José scale, is still conspicuous enough to be frequently overlooked until it is too late to save infested trees. The usual treatment recommended is to spray the trees with kerosene emulsion, but this has not been found altogether satisfactory. The spraying has been usually done before the buds burst in spring, and again later during the month of June. The matter is again attracting special attention with the object of getting a more satisfactory remedy. Trees will be sprayed with various materials, and if a practical remedy can be discovered it will be a matter of great interest to the whole country. Arrangements have been made for spraying trees with whale-oil soaps made with both potash and soda, with potash and soda lyes, and with various preparations of petroleum. Mr. W. T. Macoun has been spraying some trees this winter with whitewash, which he believes to be a useful remedy. It is possible there may be something in this suggestion, for it has been noticed for some years that trees which have been sprayed regularly with Bordeaux mixture to prevent the black spot of the apple and other fungous diseases were not so much attacked by the Oyster-shell Bark-louse as others. This immunity was thought was probably due to the lime which would remain on the branches after spraying, which it was thought was disagreeable to the young plant-lice at the time they were looking for a place to establish themselves. The life history of this insect is remarkable. It is only for two days after the young mite-like scale insect hatches from the egg that it has the power of moving about; after this it remains stationary, having attached itself to the young bark by means of its thread-like beak. It secretes a waxy scale over its body beneath which the females lay their eggs and then die. The eggs do not hatch until the following spring, and although there is only one brood in the year, this scale insect increases with great rapidity, so that they cover the whole tree, giving it a rough brown coating laid on as evenly as if the trees had been painted. When a tree gets to this condition, it seldom recovers. The same remedies recommended for the San José scale would, of course kill this insect also, but they have not been generally adopted.

*By Mr. Sproule :*

Q. Did you ever try putting ashes on trees ?

A. Yes, ashes have been tried, and it is claimed with good effect. Ashes of course contain both potash and lime, both of which are beneficial. The results, however, are hardly satisfactory enough for us to recommend the practice as a remedy.

*By Mr. Cochrane :*

Q. Do they get all over the trees ?

A. Yes, and the best results are claimed to have come from applying the ashes in the most unscientific manner one could imagine, namely throwing them up into the trees with a shovel.

Q. Yes, but I am talking about the lice?

A. Yes, all over the trees. The best of results were claimed to have been obtained by a farmer who took his cart into the orchard with the ashes in it and simply shovelled them up into the tree.

By Mr. Sproule:

Q. That is what we have done?

A. The material does not touch one quarter of the tree and a tremendous proportion is wasted?

By Mr. Cochrane:

Q. Are the trees not more vigorous where the ashes are used?

A. Yes, but the advantage is gained from getting the potash on the ground where the roots can feed on it, and the chief advantage I think in the case of infested trees is from the vigour which the tree gets, owing to the ashes which fall to the ground. The high cultivation of the soil in some orchards has been productive of greater vigour in the tree, which has enabled it to throw off the effects of the injuries done by its insect enemies.

#### ROOT MAGGOTS AND REMEDY FOR.

Another class of insects which we have been unable as yet to find a satisfactory remedy for, is the class of insects called Root Maggots. Of these, those which attack the different members of the mustard family, such as cabbages, cauliflowers, radishes, &c., are the worst. When radishes are grown in gardens, these may be protected by a mixture made some years ago by Professor Cook, of Michigan, and known as the Cook Carbolic Wash. This is made of two quarts of soft soap boiled in one gallon of water and one pint of crude carbolic acid. This makes the stock mixture of which you put one part in fifty of water when using it on vegetation. As soon as the radishes come above the ground this mixture is watered freely over the foliage and applied twice a week for three or four weeks, when it has the effect of preventing female flies which lay the eggs from which the maggots hatch, from laying their eggs at the roots. This remedy has been more successful with radishes than with onions, cabbages and cauliflowers, which is possibly due to the greater amount of foliage close to the ground, where the eggs are laid and which would have the effect of keeping the odour of the carbolic acid confined more nearly where the protection is required than would be the case with the other plants mentioned.

By Mr. Cochrane:

Q. Do they get in at the top?

A. Yes; the eggs are laid just at the soil line, and the maggots at first burrow under the skin of the root and work down until they eat all the root away. They are very destructive to cauliflowers, more perhaps than to any other kind of cabbage plant.

There are a good many other kinds of insects which have been studied during the year, but perhaps the committee has had enough for to-day.

#### CUT WORMS ON CORN.

By Mr. Sproule:

Q. Is that the same grub which eats the corn off when it comes up?

A. No; that is probably a cutworm, a kind of caterpillar. The best remedy for these is the one I mentioned before the committee last year—the bran and arsenic mixture—which is very useful in gardens. Corn, of course, is grown in large areas, which increases the difficulty of applying remedies; but in gardens a mixture of Paris green and bran has given very good results indeed.

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By Mr. Burnett :

THE BEETLE ON TURNIPS.

Q. What is a good remedy for the Beetle on turnips ?

A. The best remedy is to dust the young plants with land plaster and Paris green as soon as they appear above the ground. That has been found very good by all who have tried it. We use it at the Experimental Farm every year and find it pays us.

THE SPRUCE GALL LOUSE.

Q. What is the spruce louse ?

A. There are some insects which infest forest trees which have received attention. The Spruce Gall Louse is an insect which, although small, does a great deal of injury to spruce trees, and, as spruce wood is now used so largely in the making of paper, this insect has received a good deal of attention, particularly through the newspaper press. Statements were made that the whole of the spruce forests were going to be wiped out, but this is, I feel confident, is far too gloomy a view of the case. Where trees are grown for ornamental purposes the Gall Louse injures their appearance considerably. But, where they are grown for ornamental purposes, they can be protected by spraying them with a mixture of tobacco water and whale-oil soap, as we have done at the Experimental Farm.

By Mr. Gould :

Q. Will they attack all kinds of spruce ?

A. Yes, in time; but, strangely enough, although probably imported on the Norway spruce, that tree in this country has not been as much attacked as the other spruces; but, no doubt, it has been attacked and no record made of it.

Q. I have some Norway spruce trees on my land that were not attacked while others of a smaller size were.

A. That is one of the curious instances of an insect being the natural enemy of a certain plant, but under certain conditions not injuring it. Were the trees lately planted ?

Q. My brother got them as seedlings.

A. They were not planted this year ?

Q. No, five or six years ago.

A. I thought it might be some that were just planted.

Q. The large ones have been there twenty-five or thirty years and they are not touched. The small ones were.

A. At the Guelph Agricultural College they have a large windbreak of trees 20 or 30 feet high, which are very seriously attacked.

DEFOLIATED SUGAR MAPLES.

By Mr. Cochrane :

Q. What is your opinion regarding the maple trees that have been completely stripped of their foliage ?

A. About tapping them ?

Q. Will they be all right to tap ?

A. That will depend on the extent to which they were defoliated. If they are not stripped again this year the injury will probably not be serious, but the question of tapping them this spring is rather a serious matter for owners of sugar bushes, and has been submitted to me several times. After reflection, I thought it wise to advise that some of the trees should be tapped a little; so that the owners should not lose the whole crop, but might get some sugar for home use.

Q. There is a certain section of our country that the caterpillars cleaned out ?

A. Yes. In some districts it was much worse than in others, but I think on most of the trees there was afterwards a development of foliage to a greater or less extent, and where this was the case some sugar would be formed. Trees which

were able to lay up a good supply were probably not much stripped, and these might be safely tapped; but where there is little sugar this will all be required for the trees and taking even the small percentage of about five per cent which is usually drawn off when trees are tapped, might be very injurious to them.

*By Mr. Burnett :*

Q. Would you recommend scraping the old bark off apple trees ?

A. Yes certainly it would do no harm and would deprive some insects of a place to pass the winter.

Q. And washing the trees ?

A. Yes, as good a thing as any is simply to white-wash the trees.

Q. With lime ?

A. Yes, but that is an idea that some people do not like. In some parts of England it is a regular practice to whitewash the trees, and often too this is done for nothing but the neat and clean appearance; but it has also the effect of killing the eggs of many insects. In answer to your question as to scraping trees, it would be very useful against the Codling Moth which passes the winter as a chrysalis in crevices in the bark. Whitewashing the trunks also prevents moss growing on the trees.

**ENEMIES OF FOREST TREES.**

There are a few more insects I intend to speak of to-day but I will merely refer to them briefly in case any member wishes to ask questions about them. In the West the spruces were injured last year by a sawfly like the one which destroys currant bushes here. In addition to this considerable injury was done by the maggots of a gall gnaw which attacked the ash-leaved maples in the streets of Winnipeg, disfiguring the leaves with fleshy swellings. I am of the opinion that spraying the trees with whale oil soap in spring will prevent the female flies from laying their eggs on the leaves.

**THE NEGUND PLANT-LOUSE**

has been treated very satisfactorily in some places with whale-oil soap and kerosene emulsion, the standard remedies for all of the plant-lice. The aspen poplars in Manitoba were stripped entirely of their leaves in many localities by a small beetle shaped somewhat like the Colorado Beetle and belonging to the same family. This is the Pallid Aspen Beetle. It has a green head and fawn-colored wing cases. It may be treated satisfactorily with Paris green and water where this mixture can be applied.

*By the Chairman :*

Q. There was a severe attack here in Ottawa and vicinity upon elm trees which bled so freely it was like tar on the sidewalks and grounds. Was your attention called to that ?

A. Yes, that was late in the season. It was by one of the Plant-lice or Aphides. It was not actual bleeding of the trees but the fluid came from the Plant-lice on the tree. They emitted little drops of honey dew and these shot out like rain and the sidewalks on some streets were rendered disgusting. Around houses where these trees were planted as shade trees, it was quite impossible to sit on the verandahs or walk on the paths with comfort. I do not think anything practical can be done to stop this on large trees, but anyone who can look back for a number of years, will remember that we have had no such visitation before, and I do not think it probable that we shall have a repetition of the trouble for some time. It was an unusual visitation by a Plant-louse just as was the case with the destructive Pea Plant-louse. This insect on the elms was a gray plant-louse which multiplied inside a distorted and curled up leaf. This made it impossible to get at the colonies by spraying. It is a well known aphid on the elm but one which does not often occur so abundantly as to injure the tree.

**AWNLESS BROME GRASS.**

Before I sit down, Mr. Chairman, I should like just to mention a few facts about Awnless Brome Grass, a very valuable grass for all districts but particularly for the North-west. It has now been reported on by some thousands of farmers to whom

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we have sent seed and almost invariably—actually by all except two I think—very favorably. It has as I have said on a previous occasion apparently solved the problem of producing a large crop of a succulent grass in our arid districts of the West. Not only is it one of the best grasses for fodder or hay but it can withstand very hard treatment and will flourish under varying circumstances. In the west it grows well on dry hillsides, and in the provinces of Quebec and New Brunswick it has been found a very good grass for swampy, mucky bottom lands.

*By Mr. Sproule:*

Q. What is the proper quantity to sow?

A. For Ontario?

Q. Yes.

A. Twenty pounds to the acre.

*By Mr. Semple:*

Q. Has it good fattening properties?

A. Yes, its chemical analysis is very good. I am almost afraid to talk about this grass because one has to claim so much for it that one runs the danger of not being believed. A remarkable fact is that the hay is little reduced in value by letting it stand till the seeds ripen, which is the case with very few grasses. In Awnless Brome Grass this is due to a second growth of fresh root shoots. This grass has many advantages. It will grow on dry land or wet land. It will grow better than any fodder grass yet tried on the alkali lands of the West. On Sable Island it is being tried to hold the sand in place, and at the same time the Superintendent, Mr. Bouteillier, reports very favourably of it as a hay producer.

*By Mr. Cochrane:*

Q. Can you seed it down with grain?

A. The general practice is not to seed it down with grain but to sow it by itself; however, I saw in the *Nor-west Farmer* lately an account of a farmer seeding it down with wheat quite successfully.

*By Mr. Campbell:*

Q. What sort of a crop does it yield?

A. From two to four tons to the acre. Under irrigation at Calgary it gives an enormous crop.

*By Mr. Cochrane:*

Q. Have you any reports from Ontario?

A. Yes, but I have not pushed its cultivation in Ontario, because there are so many other grasses we can grow. It will probably prove valuable in the western parts of Ontario.

Q. We have found it difficult to get seed in Ontario?

A. It may now be purchased from all the leading seedsmen and a large quantity is now being produced in Manitoba and the Territories.

*By Mr. Henderson:*

Q. How many pounds are there to the bushel of this seed?

A. I doubt if it weighs more than 16 or 18 pounds, for it is a light seed. I should judge it would be about 16 or 18 pounds.

Q. Something like orchard grass?

A. Very like orchard grass, not quite so light?

Q. Is it costly?

A. It is very expensive still, 25 cents a pound in small quantities, brought down to about 18 cents in large quantities. I might mention that I have still about a

hundred samples of seed left, and I should be glad to send some to anyone who would like to try it.

*By Mr. McNeill:*

- Q. One pound samples, I suppose?  
 A. Yes.  
 Q. How much will one pound sow?  
 A. One pound will sow one-twentieth of an acre.  
 Q. I would be glad to get a sample?  
 A. You shall have it with pleasure.

*By Mr. Sproule:*

- Q. What time is the best to sow this grass?  
 A. In the spring.

*By Mr. McNeill:*

- Q. Would it do to sow it in the fall?  
 A. Yes, but it would be better to sow it in the spring.  
 Q. It has given as good results as timothy in the fall with us?  
 A. Yes, but our usual recommendation is to sow it in the spring.

#### WESTERN RYE GRASS.

Another good grass is the Western Rye Grass, a native grass brought to notice by Mr. McIver, of Virden, Manitoba, and I have also tried to make this better known by sending samples of it out to correspondents. It also gives good results, being a clean, straight, rich hay, the seed is easily cleaned, and any mixture of weed seeds is easily detected. It is the celebrated wild 'bunch grass' of the West, but under cultivation it becomes a better hay grass, much larger and more vigorous than the bunch grass of the bunch grass country.

#### PASTURE MIXTURES.

Of many permanent pasture mixtures, the Central Experimental Farm mixture that I have brought before the Committee on one or two occasions still continues to give satisfaction, and I doubt if it is possible to get a much better mixture than that which was published in the report last year, viz.:—

	Lbs.
Timothy.....	6
Meadow Fescue.....	4
Orchard grass.....	2
Kentucky Blue.....	1
Red Top.....	1

#### Clovers.

Mammoth Red.....	1
Common Red.....	1
Alsike.....	2
White.....	2
Alfalfa.....	2

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## TREATMENT OF NOXIOUS WEEDS.

By Mr. Sproule:

Q. You did not touch obnoxious weeds at all; I presume that will be done on another occasion. Have you ever tried spraying for weeds?

A. I did not touch on that subject to-day because I took it up rather fully last year. In my annual report this year will be found an account of some meetings held in the west, at which the chief subject discussed was noxious weeds. It is a most unfortunate matter in the North-west Territories. The subject of spraying to destroy wild mustard is probably the subject you refer to?

Q. One of them.

A. The subject of spraying weeds has come up several times and opinions differ somewhat as to the value of this method. The plan proposed of spraying grain fields with sulphate of copper in solution to destroy mustard growing amongst the crop, sounds nice and easy and certainly can be done; but I must confess I do not think it is a practical remedy. I believe the best means of cleaning land of wild mustard and all other annual weeds which sometimes spring up in fields of growing wheat or the other small grains, is to work the surface of the land after the crop is up, either with a weeder or with light harrows with sloping teeth. This will give the young crop just as much benefit as the same operation is known to give a crop of growing corn. Grain crops may be harrowed safely until the plants are 6 or 8 inches high. During the last three years this method has grown very much in favour in Manitoba and the North-west Territories, and much heavier crops have been reaped than where the fields have not been so treated. This increase in the crop is due not only to the destruction of the weeds, but from the great advantage the crop derives from the extra amount of moisture held in the ground, in the same way as is known to be the case when a field of corn is cultivated. No injury is done to the wheat plants by the teeth of the harrow or weeder dragging them up. The wheat seeds being sown with a drill, germinate and root much deeper in the soil than the small weed seeds which are close to the surface. Spraying will certainly kill the young mustard plants, but it is not such a simple operation as it sounds. In the first place, a proper spraying pump must be provided. It requires 40 gallons of water to every acre, and water is not always easily got near large wheat fields in the West. On every acre at least 8 pounds of copper sulphate must be applied and with the labour, the very lowest estimate of the cost is an extra \$1 to every acre of land under crop. Several of the large wheat farms of the West comprise many hundreds of acres, and after the farmer has sown his grain he sometimes never sees his field again until he turns in the reaper. In my own experiments I used 2½ pounds copper sulphate to the 10 gallons of water; but Mr. Shutt finds that 2 pounds are sufficient. This reduces the cost somewhat. Possibly this method may find favour on small farms in the East, but in the West I maintain that the use of the weeder and harrow is far and away ahead of it as a practical method of clearing land of all annual weeds, including mustard, for which alone it is recommended. Spraying to destroy mustard is troublesome and expensive, while it is not more effective than the use of a weeder and the application of the weeder to the growing crops is one of the greatest advantages you can give them. It gives to the growing crop the same advantage that cultivation gives to a field of corn after it comes above the ground. In some districts where there is in some seasons not quite enough moisture to produce the very best results, this very weeding with the weeder gives the wheat all the advantages of cultivation and enables it to produce better crops by withstanding drought.

Q. Would you advise that for holding moisture in the soil?

A. Yes, that is the very best means of retaining moisture. If the weeder is turned on directly the weeds are above the ground, you can keep on using it until the crop is six or eight inches high, to very great advantage of the crop and to the sure destruction of the weeds. The only difficulty is that in a wet spring it is sometimes difficult to get on to the land, but this is the case always, no farmer harrows except when his land is in proper condition, and there are very few springs when the

operation cannot be practised. For the last 4 years in my lectures to farmers in Manitoba and the North-west I have done my utmost to persuade them to adopt this method which is well known and regularly practised by the best farmers in England and Scotland. Several have done so and are well pleased with the results.

*By Mr. Semple :*

Q. Is there a danger of too strong a mixture of sulphate of copper hurting the grain?

A. Yes, if it is too strong, but if it is of the proper strength as advised by Mr. Shutt, viz. 2 per cent it can be applied without injury to the plants.

#### TOMATO BLIGHT.

*By Mr. Pettet :*

Q. Have you had any experience with the tomato blight? I have seen some that seemed to turn black around the blossom end and we lost three quarters of our crop.

A. Is it the plants or fruit which is spotted?

Q. The fruit.

A. Yes, that is the Black Rot of the tomato, it is generally most abundant in dry seasons and has been treated successfully by spraying the tomatoes with the Bordeaux mixture, from early in the season. Some specialists maintain that this disease is not due to a parasitic fungus primarily, but the black velvety fungus merely develops on the tissues after they have become diseased from some other cause.

*By Mr. McNeill :*

Q. What time do you spray for the tomato blight?

A. Very early; at the time they begin to show flowers. In fact, with ours we spray from the time they are pricked out in the beds; we keep them covered with the Bordeaux mixture. There is another kind of fungus disease which destroys the leaves, and the Bordeaux mixture is also the best remedy for that.

*By Mr. Pettet :*

Q. It was a dry season, with us.

A. The disease you refer to is generally worst in a very dry season.

COMMITTEE ROOM No 46,  
HOUSE OF COMMONS,  
Wednesday, 7th March, 1900.

The Select Standing Committee of Agriculture and Colonization met here this day at 10.30 o'clock a.m., the Chairman, Mr. McMillan, presiding.

THE CHAIRMAN,—We have got Dr. Fletcher before us here to-day. At the request of the Committee when he was here last week he was asked if it was possible for him to come back and address us on grasses. Prof. Fletcher will speak to us to-day on fodder grasses, pasture grasses, and noxious weeds.

DR. JAMES FLETCHER,—Mr. Chairman and Gentlemen,—At the end of the last meeting of the committee, as the chairman has said, some of the members wished to hear what had been done in reference to grasses and the fight carried on against

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weeds in different parts of the Dominion. I was glad to have an opportunity of speaking further of these matters, because a good deal of attention has been given them; but, as they were treated of at so recent a date, I did not think it necessary to take up the time of the committee unless asked to do so on this occasion.

FODDER VALUE AND SOIL USES OF AWNLESS BROME GRASS.

I took occasion at the last committee meeting to speak of the value of Awnless or of Smooth Brome grass. It was introduced into American agriculture largely through the work of our Experimental Farms. It is now well known and of particular value in the North-West Territories and the drier districts of the West. It is also grown in all the provinces and with a considerable degree of satisfaction, as is reported by those who have grown it. As I said at the last meeting, the success which has accompanied the growing of this grass is one which makes it hard to speak of it, because no matter what the conditions may be it nearly always turns out to be the best grass to recommend. In the far West, in the alkaline districts of British Columbia which is more nearly desert than arid, it succeeds best of any of the grasses which grow without irrigation. Further east, at Calgary, where water is available, it has done remarkably well. Where water is not available it has done better than any other grass, and in Manitoba it has now become a standard crop.

When you remember that it is only since the starting of the Experimental Farms in 1887, that this country has known this grass you can understand how valuable it must be to become so well known in that short time. I learn from a recent bulletin that it had been grown at the California Experimental Station in 1884. In 1885 seed was obtained by us from Russia and in the next season several small packages were sent out to farmers in Canada, who we knew were interested in the growing of grasses. As early as 1887 Mr. Routledge of Virden wrote down to us to say that he had tried the grass with great care, and as far as he could see it had settled the question of a large supply of fodder for dry districts, in the West, which at that time was known to be a most serious question. This was because the native grasses which were then the only source of fodder in the West got lighter and lighter as they were fed off and the land was brought under cultivation. There are many kinds of native grasses varying in quality, but they must be re-seeded and treated like all other grasses to get the necessary amount of fodder from them to make it worth the farmers while to look after them.

On account of the success which has attended the cultivation of Awnless Brome Grass in Manitoba and the North-west, others than farmers have tried it, and it has been grown for such various objects as holding drifting sand in dry, sandy districts, and it has also been found of great use in swampy bottom lands. In lands which are too swampy for cultivation under general farm crops it is found to be so satisfactory that some farmers who have tried it, now grow it to the exclusion of all other grasses. Its usefulness, however, is greatest in the North-west. When fully tested by chemical analysis, it is shown to be well worth growing, and the hay is nutritive and palatable to all kinds of live stock. We have considered it so valuable that for the last seven or eight years we have distributed a large quantity of seed to farmers, and the success of the last few years warranted us in sending it out in one-pound packages, each of which is enough to sow one-twentieth of an acre. Its value is getting to be recognized by seedsmen, and, when a plant once becomes known to them and the demand lowers the price of the seed, it soon becomes established. We shall soon have no further need to distribute this seed; but for the last four or five years we have been distributing these one-pound packages, and these have been so much asked for that it has now been tried in almost every part of Canada. We have some this year, and I would be glad, as I said last week, if any gentleman who wants it for his constituents to try, will give me their names and addresses. There is no large quantity, but I think I have 140 or 150 of these packets left, and I shall be glad to send them to any farmers whose names are sent to me. A member asked me at the

last meeting what the seed weighed per bushel. It is a light seed, and weighs only 14 pounds to the bushel, and the retail price in large quantities is now, I find, in Eastern Canada 20 cents in large quantities, and 25 cents in small quantities. I am told that in the North-west, where the grass is so largely grown, the farmers have a lot of good seed which they are selling at 10 cents.

*By the Chairman :*

Q. Per pound ?

A. Ten cents a pound, yes. This seed is very good, and I found it advisable last year to get all our seed from the North-west. We find that our western grown seed is very good, and we have not the trouble of cleaning it from weed seeds, such as are found in the seed brought from Germany. Germany produces grass seeds of various kinds, and we find it a good country to get seed from, as they make a specialty of collecting seeds, either from wild plants in the mountains or from small grass farms. Several bad weeds, however, have been introduced from Germany, so that we are rather shy of getting seeds from that quarter if we can avoid it. As for the wild seeds of the North-west, there is little danger of these, being transferred down here. Every plant has its own habitat. Those weeds which grow in the dry West are not likely to become dangerous weeds in the moister atmosphere and conditions which prevail in the East.

#### WESTERN RYE GRASS.

Another grass which we have grown with very great success and of which we have distributed a good deal of seed, is the one to which has been given the name of Western Rye Grass. This belongs to the same family as the Couch grass or Quack grass, but has not the same bad habit of throwing out underground stems. It is a bunch grass, and is, in fact, the well known and famous "bunch grass" of the West. It grows abundantly in the foot-hills and on the lower slopes of the Rockies, and from its value as a grass for stock has given its name to the district which is known as the "bunch grass country." It is an exceedingly rich, palatable grass, and one which, under cultivation, has given excellent results. I have here a sample of it, and you can see what an excellent kind of hay it makes, a perfectly straight smooth and clean hay. When grown in the arid districts of the West, it is very seldom more than from a foot to eighteen inches high, and when looking across a bunch grass country, it looks only about a few inches high; but on examining it, it is found to be from a foot to eighteen inches high.

This sample was grown in Quebec Province, and it is the same grass grown from western seed. It has the characteristics of excellent hay in that it is clean and straight, so it can be easily handled. It produces seed profusely, which is easily cleaned and handled. The quality of the grass and hay are excellent. Moreover, it has given almost as heavy crops as the Awnless Brome grass, and those who have grown it have been well satisfied with it. It has been distributed to a smaller extent than the Brome grass, because when growing it does not appear to be so attractive. Anyone growing the two grasses together, and judging from appearances alone, would never think that this was as heavy a cropper as it is.

This is a very valuable grass well worth growing in the West. It is not troublesome in the land in any way.

*By Mr. La Rivière :*

Q. Is that an imported grass ?

A. No, it is wild in Manitoba and the Territories. It was brought to my notice first by Mr. McIvor, of Virden, who has cultivated it for many years.

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*By Mr. Burnett :*

Q. Is the Bromo grass suitable for high land, or is it liable to winter killing?

A. It stands the winter very well indeed, both at Indian Head where they have long winters with the thermometer low and little snow, and at Brandon in Manitoba. I had a long letter a couple of weeks ago from Algoma, in which it was stated that this grass was exposed to a temperature of 60 below zero, which is not unusual in that country where they generally have a good depth of snow, but they had none last year and the Bromo Grass is in excellent condition this spring. This letter was from Mr. Aaron, of Wabigoon.

*By Mr. Erb :*

Q. On the farm here have you tried it in large fields?

A. Yes, on patches of a few acres, and last year on several acres. We have had it on one-tenth acre plots and one-twentieth acre plots for some years, and last year we had three or four acres in it.

*By Mr. Sproule :*

Q. How does it yield in tons per acre?

A. It gives a very excellent yield, as much as three or four tons to the acre.

*By Mr. Semple :*

Q. How much does the rye grass yield to the acre?

A. It is not easy to judge here bulk for bulk, but it is a heavy grass and yields from two and a half to three and a half tons under high cultivation in Manitoba. There are several reports upon it in the Experimental Farms Reports, both by Mr. Bedford and Mr. Mackay.

Q. Does it grow well in Ontario?

A. It has never been cultivated very much in this province, and might not be considered a sufficiently productive grass for the East. It is more of a dry land grass. Here we have Meadow Fescue and Orchard Grass, and other succulent Eastern grasses. Our methods of farming seem to require something different. Where we can grow Indian corn, there is no grass that will give the same crop acre for acre and Indian corn under the same cultivation will probably produce more to the acre than any other grass that is known in Western Ontario. During the late three or four dry seasons the cultivation of corn seems not to have been as satisfactory as it was in the past, and some farmers have been growing a new crop for early feed—a combination of peas, wheat and barley or oats, a mixture of peas with one or two kinds of grain, a bushel each to the acre and cut just as the seeds are ripening. Some farmers write that they thought they were going to give up corn and use this new crop. I believe, however, it would be a great mistake if they did, because Indian corn is a very valuable crop in this country, and I cannot understand why farmers in the western districts of Ontario should think of giving up corn, because corn will stand as much, if not more, drought than any grass we know, if properly cultivated during the hot weather.

*By Mr. Cochrane :*

Q. Is not corn a more exhausting crop to the soil than grass?

A. Yes; but I do not know that it is an unduly exhausting crop; that is simply a question of balancing accounts. It is a question of debit and credit. It pays to grow corn well and give it plenty of manure and all the cultivation it requires. I think where some farmers fall short is in the amount of cultivation of the soil after the crop is up. But, of course, there are men here to-day who know better than I do what can be done in Western Ontario, having themselves worked the land. I have only examined the crops when visiting the districts.

*By Mr. Cochrane :*

Q. But you must have a certain amount of grass seeded down to have a proper rotation?

A. Undoubtedly, but the question was the giving up of corn because of the drought.

Q. The question is how this grass compares with other grasses in Ontario?

A. I would not cultivate any mixture instead of corn in a country where corn can be grown successfully.

*By Mr. Bell (Addington) :*

Q. You say it would be foolishness for any farmer to give up corn for these grasses?

A. I think it would be foolish to give up corn in any place where it will grow. The grass I have mentioned is not a substitute. It is a permanent grass very suitable for cultivation in the West where corn will not grow; when once sown it will remain in the ground for several years. In the West it is a very valuable grass and my object in bringing it before the Committee is to show you a valuable grass, one of our native grasses and one that should be advertised freely, as it can be through this Committee in the same way as the Awnless Brome grass has been, which I claim is one of the most valuable grasses we can grow on this continent. One of the ways in which Brome grass has been brought to the notice of farmers is through the reports of this Committee and from having members of the Committee let people know of it. We have sent out many samples as I said at the last meeting, and I only know of one or two who were not pleased with it. This is somewhat remarkable because it has an underground root system similar to the well-known enemy, Couch Grass, but it has the very great advantage of producing a large amount of feed which perhaps overcomes this objection, and the objection has never been mentioned by those who have tried it. It is generally brought forward by those anxious to know before planting it if it can be got rid of. It certainly can be got rid of. In the West, where summer fallowing is part of the recognized rotation of farm work, there has been no trouble in killing it by breaking and backsetting at the proper time. In the moist lands of the East it can be overcome by deep plowing and the ordinary methods of eradicating perennial plants.

*By Mr. Hurley :*

Q. Is not the Brome grass the same?

A. It is the Brome grass I am speaking of.

Q. We sowed some of it and we cannot get it out?

A. I think you can get rid of it by the ordinary methods of cultivation, at least, we have found this to be so on the experimental farm.

Q. Is Brome grass a permanent grass?

A. Yes, both of them are permanent grasses that I have spoken of. In fact the Brome grass does not make its full head of growth until the second year. A great many reports have been received from those who had received samples, saying that the first year it was very thin and they were afraid it had not taken, but the second year it was an excellent crop, far surpassing their anticipations.

*By Mr. Featherston :*

Q. It stools out?

A. Yes.

#### SEEDING BROME GRASS.

Q. Like timothy?

A. Very much more than timothy. One of the troubles we found in getting it introduced was that a great many people did not understand it, there was such a diversity of opinion about the proper amount of seed to sow. We recommend 15 to

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20 pounds to the acre, but in the last issue of the *Nor'-west Farmer*, a writer there says he used only 8 pounds to the acre, and drilled it in with grain and got excellent results. I saw some of the crop he referred to when I was in the West last summer, and it was a splendid sample. He used 2 bushels of pease to the acre and seeded the grass with it. That was only 8 pounds to the acre, and he found it thick enough. With seed sown in drills much better results are obtained than when sown broadcast. There is a great deal of the seed wasted in broadcast sowing. Birds pick up a great deal of it that is not buried, and those seeds which are not buried deeply will germinate quickly and are dried up for want of moisture, so that much of the seed is wasted.

Q. If the ground was rolled just after seeding it would cover up that seed?

A. Of course it would to a large extent, but unfortunately it is not very often rolled; farmers just simply harrow in the seed and then leave it to take its chance.

By Mr. Bell (Addington):

Q. This Brome grass, how does it succeed on damp soils like muck lands?

A. It has done well in New Brunswick on black muck lands, even where there was little soil. It has done very well indeed in some of the interval lands both in New Brunswick and in the province of Quebec.

TIMOTHY AND CLOVER HAY.

By Mr. Erb:

Q. What are its advantages on soil like that on the Ottawa farm? Would it be advisable to substitute Brome grass for timothy and clover for the bulk of the hay crop?

A. No, timothy and clover hay not only is of very great intrinsic value but it has an artificial market value too. Its intrinsic value is attested by the fact that the Government when sending the large quantity of hay recently shipped to South Africa asked for nothing but timothy and clover, this mixture was wanted because it was known to have great value. Besides it would be no gain to a farmer to substitute anything for timothy and clover even if it had greater intrinsic value unless that fact were well known and acknowledged; for people would not buy it; you would be out of the market. Timothy and clover is a hay which sells in the market on sight. Anyone who has a good crop of it knows he can sell it; therefore, it would not be advisable for a farmer to substitute Brome Grass for timothy and clover, unless he were growing for his own use, in which case of course it would be for him to consider which he would prefer. It is very hard to substitute anything for timothy and clover on the market. You can add to this supply of feed by growing corn for feeding green or as ensilage. If you have rough lands that will not produce timothy and clover you can then grow Brome Grass to advantage. A great deal of attention has been given to this grass in the interest of the Western provinces because some years ago we knew little about the climate and what crops would succeed, and there was no experience to draw on with respect to what other people had grown successfully. We had therefore to watch carefully and study the requirements and possibilities of a new country. All over the North-west Territories we have excellent men as correspondents who are accumulating information of value to themselves and others; the farmers there are I think more of a reading class of men than we have as a rule in the East. I find that all the farmers there are keen to know what is best for them to do and they read religiously the agricultural journals. You can hardly go into a house that you can't find three agricultural papers there, the *Nor'-west Farmer*, the *Farmers' Advocate* and the *Weekly Star*.

By Mr. Broder:

Q. They have more leisure time?

A. I do not know about that. I can't say anything about that, but I do say they want to know. On account of the difficulties of the situation more effort has been made to try new crops in that country and Awnless Brome grass has been one

of the valuable results of these efforts. In the East as I have mentioned, we cannot do without corn. It is a most valuable crop and we must stick to it. In this part of Canada where we never have either heavy failures or prodigious successes, but always get a pretty good crop, we can try nearly all the crops recommended for farming in Canada. But when we get down to the sea, to Nova Scotia and in British Columbia, we find more nearly the English conditions and can make use of information found in English books and papers. To give an illustration of this, in Nova Scotia and the other Maritime Provinces they can grow to perfection many of the rich English grasses that we can't succeed with here at all. Anyone that takes any interest in the hay crop always likes the Sweet Vernal grass, which smells so very sweet. We can't have it here, simply because it will not grow; but in Nova Scotia it grows and succeeds very well, and in British Columbia the same. In Nova Scotia, British Columbia and New Brunswick it grows well. Then there is the Meadow Foxtail which we can't grow up here at all, but in Nova Scotia it succeeds so well that it has become wild and is somewhat of a nuisance in hay meadows. As it ripens earlier than the other grass, it is always ripe and at its prime before the other grasses are ready to be cut for hay.

#### MIXED GRASSES.

In mixing grasses for pastures or for hay, it must be considered when the different grasses used will be at their greatest state of perfection. With hay grasses that is almost invariably when the flowers have passed away and the seed has begun to form; the food elements are then distributed evenly throughout the whole plant, and if the grass is cut at that time, it is more valuable for feed than later. After that period a large proportion of the nutritious principles is transferred to the seeds. Consequently, unless grass is cut before that takes place, its food value is very much reduced. Awnless Brome grass is an exception to this rule, for although nearly all grasses are reduced in value as the seed ripens, from a special circumstance, Brome grass is not, and the hay upon which the seeds have been allowed to ripen before cutting, is worth almost as much as though cut at an earlier stage. This is due to the fact that, as soon as the seeds form, a new growth of young shoots takes place from the root, so that the late cut hay is heavier and thicker and of an equally good quality as that cut in July when the seeds were just forming. A great deal of the hay made by Mr. Mackay during the last year or two at the Experimental Farm at Indian Head was Awnless Brome grass from which the seed had been threshed. This was because we wanted the seed and we found the hay equally good. Of course a grass that is allowed to ripen its seed draws off a larger amount of nourishment from the roots than it is advisable to take if heavy crops of hay are to be cut for more than one or two years. Where the seed was allowed to ripen we found that the next year's crop was very much less. If Brome Grass or any other grass is grown for hay only, it is advisable to cut it as soon as possible after the flowers have fallen, and then in those kinds which give an aftermath you have a good crop in the autumn and without the same weakening effect on the plants which I have referred to.

#### PROPORTIONS FOR MIXED SOWING OF TIMOTHY AND CLOVER.

*By the Chairman :*

Q. There is just one important point in regard to the mixture of clover and timothy in hay for sending to the old country: There is such a large quantity going this year and Canadian hay is taking such precedence in the English market and as there may be a very extensive trade spring up, I think it would be well if you could say how much clover should be put in to give the best mixture.

A. I am afraid that I cannot answer that question off-hand, because clover in a certain sense has an artificial value. To find out what proportion these plants should bear to each other, we have mixed clover and timothy together in various quantities and find that a mixture of 12 lbs. of timothy to 8 lbs.

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of clover gives the best crop with us here on the experimental farm. Many farmers in Western Ontario, sow less timothy than 12 lbs. and do not care to grow clover as much as we do here. In some places they seed down with as small a quantity as 4 lbs. of timothy and get a good crop. If we were to sow only 4 lbs. timothy here, it would not give us any crop worth cutting. We have tried at the experimental farm a large number of mixtures, starting with 4 lbs. of each and running as high as 16 lbs. of each, and we found, as I say, that the mixture which gave us the best hay and the largest quantity of it was 12 lbs. of timothy and 8 lbs. of clover. The proportion of clover which should be allowed in hay of first quality is to a large measure a matter of taste. Some people won't buy hay if there is any clover at all in it.

*By Mr. Featherston :*

Q. That is for horses only ?

A. Yes, I know ; but I am speaking of the market, and the requirements of the market seem to vary. A few years ago in the market here in Ottawa, buyers would have no clover in hay. If there was any clover among hay, they would decline to buy it and say : " We do not want any clover in hay." Last year, however, opinion had changed and mixed hay sold well here. The only answer I can give to the chairman's question then is that with us here a mixture of 12 lbs. of timothy and 8 lbs. of clover has given the heaviest crop of what we consider first class hay for all stock.

*By Mr. Cochrane :*

Q. Has the experimental farm any knowledge of the proportion of clover and timothy which was shipped to South Africa ?

A. Yes, I do not myself know exactly what the proportion was ; but I think about  $\frac{1}{2}$  or  $\frac{1}{3}$  of the hay was clover, it was examined by some of our officers and no doubt they had a fixed standard.

*By Mr. Broder :*

Q. When you want to feed hay to cows, the mixture of clover with timothy is right, but for horses you want clear timothy.

A. This hay was for horses, mules and oxen.

*E. Mr. Featherston :*

Q. I find that hay which is made up of half timothy and half clover, sells better in the English market than hay which is all timothy.

A. Do they like as much clover as that ?—Well, the mixture of 12 lbs. timothy and 8 lbs. clover which I have mentioned would about give half and half, but what was demanded by the government for South Africa, was, I think, a smaller proportion of clover than that.

MR. COCHRANE.—It seems to me, Mr. Chairman, that this is an important point, because if there is a market we want to know what its conditions are and what is the class of hay which sells best.

THE CHAIRMAN. That is the very reason I asked the question, because it is of great importance to know what the best quality of hay for that market would be.

DR. FLETCHER.—Well, if hay consisting of equal parts of timothy and clover is required, seeding with 12 pounds of timothy and 6 or 8 of clover will about give that proportion the first year ; in the second year the timothy will preponderate ; but, as every one who has grown clover knows, this crop is very much affected by the season. In the first year after seeding, clover makes the bulk of the crop and holds down the timothy, but in the second year the timothy gets the upper hand. I believe it is impossible to give the exact amount of seed which would produce hay with certainty which would be half and half.

By Mr. Cochrane :

Q. There was a thought struck me in what you said about Brome grass. Did I understand from you that, if we had Brome grass, it would not do to sow peas with it, the roots would be so troublesome?

A. No, I didn't say that. I don't think that you would have very much trouble in doing that. If you wished to do so, you could certainly sow Brome grass with peas. Peas would not be a very good crop to sow grass with, because peas cover the ground so thickly that they would smother out much of the grass.

By Mr. Wilson :

Q. What is the smallest amount of seed from which you can get a good crop?

A. Do you mean here in this district?

Q. Yes, of timothy.

A. Well, about the best mixture was 12 pounds of timothy and 8 pounds of clover; but in favourable seasons less seed will answer. Clover is so apt to be winter-killed, that unless plenty of seed is sown, an occasional crop is sure to be lost. With the quantities I have mentioned we have never had a failure.

Q. Some people say 6 pounds is best.

A. Yes, that may be enough in some localities, and in certain seasons; but the mixture I have given you is the one which we have found from our experiments here to give the heaviest and surest crop.

By Mr. Calvert :

Q. A good deal depends on the land and the season?

A. Undoubtedly, and also, I think it depends largely on the amount of generosity which a man feels when he is buying seed. Plenty of people would sow more seed if they were wiser. One trouble we have among farmers in Canada is that they sow too little seed. If a man would spend a little more when buying his seed he would find it pay him well; a few cents saved in buying a pound or two less seed to the acre is very poor policy.

By Mr. Bell (Addington) :

Q. In your opinion the mixture should contain not less than 12 pounds timothy and 8 pounds clover?

A. That is my opinion.

Q. That is my opinion too.

A. We cannot sow less and get sure crops every year.

By Mr. Semple :

Q. It depends on the season, whether moist or dry?

A. Yes. We never had such clover in this country as we had two seasons ago. It was as high as my waist and as even as a billiard table. The condition of the soil also makes a difference. When the soil is moist every seed you put in will grow, both of timothy and clover. With all the conditions favourable, less seed is required to get a good catch. It is even possible, if the quantities I have given are exceeded, to sow too much seed, when the young plants crowd each other and do not develop properly.

#### PROPERTIES OF VARIOUS NATIVE GRASSES.

I will now draw your attention to this sample of native grass which closely resembles the Awlless or Smooth Brome grass, it is known as the Western Brome grass (*Bromus Pumpellianus*). It is common in the foot-hills of the West. It has given good satisfaction in some districts; but its usefulness is much more limited

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than that of the Awnless Brome grass. It does best in the foot-hills, growing generally in woods or in coulees, and gives better results there than even the Awnless Brome.

## BALD WHEAT GRASS.

Another native grass which I will call your attention to is this of which I have a very fine sample with me to-day. It is called the Bald Wheat grass (*Elymus submuticus*). You see that the head bears a close resemblance to an ear of beardless or bald wheat. It is an exceedingly heavy cropper and is of very good quality. It gives little aftermath but furnishes a large crop of smooth clear, heavy hay, of good quality. The head contains much grain if the hay is left until the seeds form. For some reason, this grass has not become a favourite with farmers; but I consider it well worthy of more attention than it has received.

By the Chairman:

Q. Where does it come from?

A. It is found in Manitoba along the river sides, and is a western variety of the Virginia Lyme grass. It is a very rich and heavy grass, and gave the heaviest crop on our experimental plots of all the native grasses we have grown.

I will now show you a very fine sample of the ordinary timothy which was grown in the Algoma district, and it illustrates how well fitted that country is for growing timothy.

By Mr. Bell (Addington):

Q. I think that is rather above the average?

A. Yes, undoubtedly it is. It was sent in, however, as an ordinary sample. Timothy seems particularly well adapted to that northern country. I once collected a bunch of it at Sudbury while walking along the railway track and was able to gather quite a large bundle of which the stems were actually 7 feet high. This was several years ago, before the vegetation in that district had to such a large extent been spoiled by poisonous fumes from the mines. It seemed extraordinary to me that timothy should grow to such size on the bare clay banks of the railway where there was apparently little food for it.

Of course, it does not attain any such height as that I have mentioned when cultivated in fields at Sudbury.

## NORTHERN BLUE JOINT.

Another excellent native grass to which I will draw your attention is the Northern Blue Joint (*Deeyuxia Langsdorffii*). It is one of the few grasses that will grow actually in water. It grows naturally on cool damp rocks and by lake and river sides. It is closely allied with the Common Blue Joint, and, like it, is essentially a low land grass which produces a large crop of soft leafy stems. The only trouble is that it is hard to get the seed to ripen well and the seed is not to be bought in the market. Every one who sees this grass growing at the experimental farm asks for seed and every seed we can grow is sent out to correspondents; but I have not yet been able to get a sufficiently large amount of seed to get it thoroughly established. It is a form of the ordinary Blue Joint found all over the continent, which is also very good grass. Some farmers have collected the seed of the latter on their farms and cultivated it to some extent. The Northern Blue Joint was collected on the rocks north of Lake Superior and is rather a better hay grass than the ordinary form, the stems being more slender and bearing more leaves.

By Mr. Calvert:

Q. Will it grow well on high lands?

A. Not very well on high dry lands, but in lands suitable for ordinary crops it succeeds admirably. The Grass Plots at the experimental farm are neither very

high nor very low where this is grown. There is one low part at the bottom and the land gradually slopes up to a higher level. The plot of this grass is about half way up, so that it will succeed very well on ordinary farm lands.

#### DROP-SEED GRASSES.

I now show you samples of two grasses which I think will be thought to be of considerable value when they are more cultivated. They both belong to the same family of grasses called the Drop-seed Grasses. They are very late in maturing; the hay is not ready for cutting till August, and a good succulent crop of hay in August is very valuable in many parts of the country. The hay is particularly heavy for its bulk, nutritious, and much relished by stock. The stems are rather harsh and woody at the base, but there is a sufficient quantity of good succulent rich grass at the top to render these grasses well worthy of cultivation. They are known by the names of Satin Grass and Wild Timothy. As can be seen from the sample I have here, the heads look something like timothy although the two grasses are not at all closely related.

#### FRINGED BROME AND HOOKER'S BROME.

I will now show you samples of two more kinds of the Brome grasses, one mentioned because it is not particularly valuable; the other because it is. I speak of the first one because it is an attractive looking grass and many farmers throughout the country who have become interested in grasses and were looking out for new grasses have almost invariably hit on this one and cultivated it to some extent. It grows three or four feet high and produces much seed; but I do not think it is as well worthy of cultivation as many others. The seeds very soon become hard. There is an enormous amount of seed and the weight of hay produced per acre is light for the amount of growth. It is called the Fringed Brome, and it is recommended by many writers on grasses; but is a grass I do not feel inclined to recommend.

On the other hand there is in British Columbia a wild grass growing in the coast range and on Vancouver Island, which produce a heavy crop of rich succulent grass. Although sometimes rather small this grass is well worth cultivating. It is a perennial grass and late in the season produces a heavy aftermath. This grass is of value because it gives a crop of green grass at a time of the year when most grasses are dried up. It is called Hooker's Brome grass and is very much like Schrader's Brome grass.

*By Mr. Featherston :*

Q. Have you grown that here ?

A. Yes. This sample was grown here. It is not a very tall grass. It looks better tied up in a bundle in this way than it does when the plants are growing wild; it has rather a drooping habit, but we take the weights of each kind we grow and thus have learned that it produces a heavy crop. It is a grass that has been grown for a good many years by Mr. Duncan, of Duncan's, Vancouver Island, and he has a plot of it which he saves until later, when his other grasses have been fed off.

#### TALL OAT GRASS.

I have here a bundle of Tall Oat-grass, a grass which under the name of 'Fromental' has been grown to some extent in the Province of Quebec. I do not consider that it is a grass of any particular value either for cultivating alone or even for mixing with other grasses, because it is not a grass that produces a very heavy crop. Most writers who have referred to it state that it has a bitter principle. I have never been able to detect this myself; but it is claimed that this is one reason why it is so useful, because it acts as a tonic. It is rather a nice looking grass but we have other grasses much better, and I do not think it should be recommended for very extensive cultivation. In the autumn it throws up long leafy barren stems, that is without flowering heads, but bearing leaves all the way up the stem. A good point is that the seed is always abundant and can always be

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obtained from seedmen. This is a rather important feature because there are many grasses I would like to recommend if the seed was available, but unfortunately it is not.

## ONE SIDED WHEAT GRASS.

I have here a sample of another very heavy native grass which, however, has not proved attractive to farmers and they do not care to bother with it. It is the one-sided Wheat-grass, a native that produces a heavy crop. Farmers who have tried it generally say it is a good grass, but do not raise it again. There is a good deal of heard about the heads, and I think that is the reason farmers haven't taken to it. It is a very heavy cropper.

The Tall Fescue is one of the most valuable English grasses, and has been introduced into all parts of Canada. It is very valuable in Nova Scotia and the other Maritime Districts, both on the east and west coasts. It is also useful in Ontario. It is a deep feeder but one which is rather a heavy feeder on the land, and possibly, for that reason, I think it has not been accepted to the extent it might have been. It is certainly a very valuable grass, very succulent and always a heavy cropper, particularly for the first three years.

Red Top is a grass which should be sown in all wet land, and particularly on such lands as are too wet for general farm crops. It is now thoroughly established as a wild plant in all parts of the country and can easily be distinguished in low land by the feathery reddish purple heads and slender stalks. Some of its special uses are that it forms a thick bottom in hay, and on wet boggy lands which will not bear the weight of stock it soon forms a tough sod which prevents animals from sinking. The hay is light but of fair quality, and it is well to put some in all mixtures for low ground.

## RHODE ISLAND BENT GRASS

*Jugostis canina*  
Is a grass which grows in the Maritime Provinces and is very often recommended for lawns, but it has no special characteristics that make it preferable to the ordinary Red Top, and as the seeds are very much more expensive, the ordinary Red Top answers as well. It is rather finer and has a better colour but has no especial agricultural value. It makes, like Red Top, a thick bottom, which is one of the desirable features of a good hay grass.

## FOWL MEADOW-GRASS.

*Poa serotina*  
I have here a bundle of a grass of much value which in Manitoba is known by the name of 'Red Top.' It is not Red Top, nor does it belong to the same family; the proper name is Fowl Meadow grass. It is one of the Poas and is much more nearly related to the Kentucky Blue grass. It is an extremely valuable grass, which grows in low lands and is particularly abundant around the large sloughs which you find in the wooded country of the North-west Territories, and wherever there is an extensive hay slough in Manitoba it is almost invariably covered with this grass to the exclusion of all other species. It has a special value, because, like Awnless Brome grass, after the seed is ripened, it throws out fresh shoots from the stems which remain green, giving the grass extra value, from this special circumstance.

## KENTUCKY BLUE GRASS OR CANADIAN JUNE GRASS

Is one of the most valuable grasses that grows, and, best of all, it is a grass that is known to everybody. It is a grass that in various forms is native all over Canada, and it has also been introduced under the name of Smooth-stemmed Meadow grass, which is found in the English catalogues. These forms all resemble each other somewhat, and it is difficult to separate the native forms from the imported. The variations are chiefly in the number of stems produced, or the quantity, length or colour of the leaves. Some are much more valuable from an agricultural standpoint than others. By selection, exchange and collection of seeds from a great many

districts we have now growing at the experimental farm six varieties which are all distinct, not so easily separated by the botanist, because they are much alike in important structural characters; but to the agriculturist they are all distinguishable either from the lateness of the season at which they flower, the leaves, or the thickness of the bottom growth. Some of the Manitoba forms have very few stems and one of the forms found growing wild at Glacier in the Rocky Mountains is exceedingly leafy. As a lawn grass for general purposes this is the most valuable form I have ever seen.

#### THE HARD FESCUE

Is a grass which closely resembles Sheep's Fescue, which is invariably recommended in seed catalogues for growing in high sheep pastures. From our experiments and from correspondence, I have found that Hard Fescue produces more hay and is a more valuable grass than most of the several varieties of Sheep's Fescue of which we have been able to obtain plants or seeds. Closely resembling the Hard Fescue is the Red Fescue, and the chief difference between the two forms is that Red Fescue has underground shoots by which it spreads from the roots.

#### OLCOTT'S RED FESCUE.

Of all the different varieties which we have grown or imported, there is one called Olcott's Red Fescue No. 1, which was discovered by Mr. J. B. Olcott, a well-known specialist in grasses living in South Manchester, Connecticut. He has separated this from a great many hundred different kinds, and it is certainly the most remarkable form of this species for lawn purposes I have ever seen.

Some years ago Mr. Olcott sent me a little sod which I divided carefully and I have now two splendid beds of it. I have also a plot grown from seed which comes true to the variety. It is a very deep rich green, with long fine hair-like leaves, and is perfectly hardy. It is a most valuable grass for lawns and far exceeds in this respect any of the other forms of Red Fescue, I know. There is a great difference in the various varieties, and there is almost as much variation in some of these wild grasses as among the cultivated forms. I mention this grass now because I have a small quantity of seed to spare, and I shall be glad to give it to any one who is especially interested in lawn grasses.

#### COCK'S FOOT GRASS.

*By Mr. Burnett :*

Q. Have you had any experience with Cock's foot?

A. Yes, we grow it every year. It is an excellent grass, exceedingly succulent, a heavy cropper and tolerably hardy. It likes a deep soil and is a rather heavy feeder. It is also a very hardy grass in the way of resisting drought, staying in the land for years if only it once gets a good start. There is sometimes difficulty in getting the young plants through the first winter. It is very much like Alfalfa in that respect. I have tried it on several different plots at the experimental farm and found some difficulty in getting it to take well. It is exceedingly quick in recovering after cutting, shooting up two or three inches in a night after a rain. It is an early grass and is ready to cut by June 20, and should be cut early. This grass particularly requires early cutting, much more so than other grasses because it is apt to get woody and hard, when cattle will not eat it. It is the same grass as we call Orchard grass in this country.

*By Mr. Sproule :*

Q. How much do you use of this Olcott's Red Fescue?

A. The seed is not in the market at all. It cannot be bought, I have a few ounces of it which I shall be glad to give to any one.

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## RECIPE FOR PASTURE MIXTURE.

I mentioned the experimental farm pasture mixture, last week, which has given us such good results of all the mixtures we have tried for several years. I have been requested to give again the composition of this mixture. It is 6 pounds of Timothy, 4 pounds of Meadow Fescue, 2 pounds of Orchard grass, 1 pound of Red Top, and 1 pound of June grass. With this mixture 8 pounds of clover, 2 of Alsike, 2 of Alfalfa, 2 of White Dutch, 1 of Common red and 1 of Mammoth red. That is the best mixture we have tested.

*By the Chairman :*

Q. That is for permanent pasture ?

A. Yes, for permanent pasture.

## NOXIOUS WEEDS.

The other subject I have been asked to speak on to-day is weeds. I have just been speaking of plants which may, perhaps, be called the most useful. The next part of my address will deal with the most useless of plants viz., Weeds.

This question of weeds is of importance to all of us in every part of the Dominion. There is no farm that is worth using which will not, unless watched carefully all the time, produce a great many weeds. The fact that a farm is found to be weedy must not always be taken as irrefutable evidence at any rate that the man farming it is a bad farmer. Allowing a farm to remain weedy may be taken as evidence that bad farming is practised, but a farm that is found to be weedy by a new occupant requires sometimes a great deal of cleaning before it is fit to use, and it may even be a question, especially on a rented farm, whether it is worth while hiring a farm at all, which is so weedy that it will cost more to check or clear off the weeds than the crop will pay back. There are actually some farms as bad as this in Canada. But when a man runs his own farm he takes more interest in it and keeps his land clean, for there is no doubt that all weeds can be eradicated and the land cleaned of these enemies if the nature of the different kinds is understood and a persistent warfare against them is kept up. This statement is made after many opportunities of seeing farms in some of the weediest districts of Canada, which have been cleaned by the farmers working hard, and particularly when they do so with a knowledge of the nature of the plants they are fighting against.

Now, all the plants classed under the one word 'Weeds' have their own special natures, and in making up a list of the hundred worst weeds, few people would include all the same kinds, for there are several which some people would think should be included from their obnoxious characteristics in certain localities which in other places are hardly known. However, there are about twenty weeds in every district which cause much loss to farmers, and the nature of these should be understood by all. What is actually the worst weed in any district is a very indefinite term, and usually the plant stigmatized as the very worst weed is simply the one which has given the individual farmer spoken to the most trouble at a recent date. I made a list some time ago of all the plants, which, according to the statements of farmers, were the very worst weeds, and found that on that list there were no less than twenty-three kinds.

## STINK WEED.

To give an instance of this: In Manitoba undoubtedly the worst weed, from the loss it occasions in many ways, is the Stink Weed, also called Penny Cress, and 'French weed.' This was mentioned in last year's report of this committee. It is a most persistent nauseous weed, has thoroughly established itself, and it has shown that it has more power of resistance to all the ordinary methods of cleaning land than perhaps any other weed farmers of the west have to contend with. So much

indeed is this the case that many intelligent farmers will tell you to-day that it is absolutely impossible to get it out of land which has become thoroughly infested. This weed is so abundant about Winnipeg and in the rich lands along the Red River Valley that in the early spring the whole country seems to be covered by a deep green velvety carpet, and yet in that very district some of the farms are kept clean by good farmers who do not believe that it is impossible for any weed to be exterminated if they only go the right way about it. Now this, I believe, all things considered, is the worst weed in Canada, and yet around Winnipeg and in other parts of Manitoba where it is worst, there are farms practically clear of it now, which were once thoroughly infested, simply by the farmers understanding its nature and taking the proper steps to keep their farms clear.

#### WILD PRAIRIE ROSE.

In the south-west of Manitoba the worst weed is said to be the Wild Prairie Rose, a beautiful little bush that grows only as high as your hand but bears often half a dozen lovely flowers on it, all open at the same time. It has an extensive system of deep underground woody rootstocks which are difficult to destroy. This fact has gained for it the reputation of being the weed of all others which gives them most trouble, according to the methods of farming which are generally adopted in that district. This was the worst weed all the time they did not know how to get rid of it, but they have learned how it can be controlled, by disk harrowing the land twice at short intervals, after ploughing and now you do not hear so much about it.

When you travel through different sections of the country you find certain weeds increasing and giving trouble owing to the method of farming followed, and these weeds are usually called the worst. Instances of these are Couch grass, which must be fought with shallow ploughing, and Indian hay or Sweet grass, which requires the opposite. It is for every man to find out the weed that causes him most trouble, and I make the statement that there is no weed which cannot be fought successfully if you will study its nature. Of course there are some weeds which are much more difficult to eradicate than others and which seem to be so thoroughly established in different parts of the country that their eradication is a matter of extreme difficulty.

#### THE SOW THISTLE.

For instance, there is the Perennial Sow thistle, now very common all through Quebec, down into New Brunswick and right up into Ontario, which is certainly the worst weed in many districts. It possesses to a superlative degree every characteristic of a bad weed. It is a deep-rooted perennial of rapid and vigorous growth, with many fleshy underground stems, the tip of each of which develops into a strong plant which crowds out the crop amongst which it grows. A single seedling throws out several shoots, so that the first year you have a seedling which, at the end of the season, has spread out in every direction forming a colony of young plants around a central point, each one of which forms a rosette of leaves as big as a tea plate, and then the following spring these spread out and prevent any crop plant from developing beneath their shade. From each of these, later in the season, springs up a tall stem which bears a large number of seeds furnished with copious white down which carries the seed far and wide, each one of which may found a new colony of plants. The down itself is also a cause of inconvenience to threshers by breaking up into particles which get into their eyes and give rise to painful irritation.

This weed was introduced from Europe by accident and has been allowed to spread widely throughout Canada because its noxious nature was not known. It is a very aggressive pest, perhaps worse than the Canada thistle. The Canada thistle is well known and good farmers know they can get it out of their land. Even where the Canada thistle is not so well known, its notoriety has spread before it, and so soon as it is recognized a feeling of panic takes possession of the farmers

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and they say 'this is the worst weed we could have, we will therefore prevent it from establishing itself', and it requires little persuasion to induce every one to attack it. Now I repeat, no weed is so bad but a farmer can get it out of his land if he will understand its nature first and fight it steadily and persistently.

## CLASSIFICATION OF PLANTS.

Plants can be classified very simply under the three heads of annuals or one year plants, biennials or two year plants and perennials or many year plants. With one year plants any method by which the young seedlings are destroyed before producing seed is enough to clear the land. With two year plants the same thing is true, only that the farmer has a longer time to do his work because these plants blossom only the second year and then die. Perennials flower only the second year but the roots live for many years.

By Mr. Burnett :

Q. Does not the sow thistle spring from root and seed ?

A. Yes, both. It belongs to the last named order, perennials. Having made a certain amount of growth the first year the flower is produced the second year and then the roots, instead of dying as in the case of two year plants, keep on growing year after year and spread from the root as in the case of the Canada thistle, Perennial Sow thistle, and many others, and these are by far the worst weeds we have to fight against. For the purpose of knowing how to destroy perennial plants they must be classified as those that root near the surface of the ground, like the Ox-eye daisy, and those which go down deeply. The shallow rooted perennials are easily dealt with when you can plough the land. Of course when they take possession of upland or rocky pasture land where it is hard to plough, we must adopt other means of destroying them. Shallow rooted plants in agricultural land are got rid of by ploughing in the hot weather when the roots are thrown up and left lying on the surface where they quickly die for want of water under the withering heat of the sun. With deep rooted plants we have to consider that like all plants and animals, they have to feed. They feed through the roots and leaves. If we know that it is necessary for all plants to feed, any method by which we can prevent their feeding and starve them out is an effectual means of getting rid of them. These are all the elements of botany that the farmer need understand to fight weeds successfully.

## VALUE OF DIFFUSING INFORMATION.

This has been made very patent lately in Manitoba. The provincial government during the last three or four years arranged to have several meetings held and lectures delivered at which all the prevalent weeds were described and the best methods for destroying the different species explained in the various districts visited. In addition a conspicuous and complete exhibit of the weeds of the province has been shown at the Winnipeg summer exhibition for the past two years.

The arrangements for the meetings referred to were as follows:—Competent speakers including the energetic chief clerk of the Department of Agriculture Mr. Hugh McKellar went to districts where farmers' meetings had been advertised, all of which were well attended by farmers who were invited to bring specimens of the weeds troubling them, and other weeds likely to be introduced were taken there. The actual weeds were shown to the farmers, their characters explained and the methods of eradication made plain. The North-west Territories last season adopted the same plan. The government previously published and distributed a bulletin on noxious weeds in which all the different weeds of the district were described. The farmers were invited to attend meetings and a series of twenty meetings were held last Summer; although the meetings were held in July, when the farmers have a good deal to do, the interest was so keen that all of the meetings were crowded. The

Hon. Mr. Bulyes, the Provincial Minister of Agriculture went himself to the meetings and they were very successful. The British Columbia Government has also held two series of meetings during the two past summers all of which were attended by the Deputy Minister of Agriculture, Mr. J. R. Anderson, so that the subject of weeds in the West at any rate, is receiving a great deal of attention, with beneficial results. As a consequence weeds are not by any means as prevalent as they were four or five years ago. The lands had become very badly infested and farmers saw that it was necessary to do something to clear the land. The nature of the different weeds seem now to be understood and farmers are adopting methods to secure their extermination. Never in the history of the country was there such a clean crop of wheat as last season in Manitoba. Generally there is some other influence that militates against the crop, and this year the Hessian Fly, our old enemy in Ontario, appeared in Manitoba and injured the crop to a rather serious extent. The freedom from weeds this year was no doubt largely due to the character of the season. The late spring held back the seeding but the seeds of the weeds were in the land, and these being of hardy, well established plants germinated and then when the seeding was done the cultivation of the land destroyed a lot of weeds. In addition, the method I spoke of last week, of harrowing and cultivating with weeders has become so generally adopted in the west that the value of this very wise and useful operation is recognized by the best farmers and although there are some who do not adopt it, many others do, and most see the benefit of it. At the Agriculture shows and the Summer fairs at Brandon and other places there are always a great many inquiries as to the best implements to use and the sale of light harrows and weeders has been very large indeed in Manitoba in the last few years. All this points to the same moral,—the difficulty of controlling all weeds is made less by understanding the nature of the different kinds we are fighting against. If we understand them the fight is very much more satisfactory because when you get good results you know the reason, and can employ the same method again or tell others of it.

## OX-EYE DAISY.

*By Mr. McNeill :*

Q. In regard to the Ox-eye Daisy, you said where land can be ploughed the better way is to plough it, but there might be other places where it could not be ploughed. Is there any other mode of eradicating it in such places?

A. I am afraid not for the Ox-eye Daisy. With few exceptions, the application of chemicals is not practicable. This weed has a strong aromatic flavour, and sheep which are the best weeders we have for some plants, do not seem to like this one very much, and I am afraid there is no other mode except rooting it out.

*By Mr. Broder :*

Q. I know of one case where a field was completely covered with Ox-eye Daisies. It was close to my own farm. The owner sent a man in to mow it at a certain time of the year and there was not a vestige of it next spring. For some reason or other it disappeared. I do not know whether it was because it was done at a particular time.

A. It is a perennial, so the cutting would not affect it, but I cannot explain the disappearance. The best remedy where you can plough the land is to seed down with clover and timothy, because the daisy flowers just about the same time as you cut your first crop of hay, so no seeds are formed, and the second crop you cut again just before it seeds; then in ploughing under your clover you destroy the plants which only root near the surface and have no running root-stocks.

Q. This was under my notice every day in Summer, and I cannot understand it.

A. The only thing that suggests itself to me is winter killing.

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Q. There was very little snow and a very severe winter, and the Fall wheat was killed last year in our locality, which may have affected this Ox-eye Daisy.

A. That is the only thing I can suggest, because it is a perennial plant, which usually lives many years.

*By Mr. Rogers :*

Q. Close cropping with sheep is the best thing ?

A. It is, for most weeds.

Q. I have seen farms cleaned in that way.

A. Sheep will keep down many weeds, but I doubt if they will this one.

*By Mr. McNeill :*

Q. Is there any season when you can cut undergrowth when it is less likely to grow than at another season ?

A. No; I do not think so.

Q. I had at my own place two cases of the undergrowth being cut on two occasions; some of this undergrowth which was cut I did not wish to have cut at all, and I thought it would grow up again, but on neither occasion did it grow, although it generally grows very freely ?

#### THE CANADA THISTLE.

A. The question of cutting at a certain season has been very much spoken of in regard to the Canada Thistle, and the statement is often made that Canada Thistles, cut at a certain season, will rot or bleed to death. I have cut thistles at different seasons and find it is not a fact. The reason is, that, if a plant is living on something else laid up for it, it will feed on that all the time it lasts. The life history of the Canada Thistle is well known. It makes a small growth the first year; the stem dies down in the winter right to the ground, but is not killed by the winter. It is merely the stems; the underground stems are very much alive. Next season these underground stems or root-stocks throw up many flowering stems, which live at the expense of the food laid up in the underground stems. At any time you cut the plant that season, you will only cut away so much of the growth which has been living on the supply of food in the root-stocks. If the plants were cut two or three times during the season, it would have much more effect than one cutting. As to bleeding to death, there is absolutely nothing in it. The stem will never rot until it is dead. If you can cut it down right to the surface of the ground it will only make the plant throw up one or two more stems from the root. No water is going to get into that stump and rot the root; besides, if you cut late in the month of June, the time usually advised, there is that that is the time of the year when the thistle has drawn off the largest amount of the prepared food laid up last year, and it has not yet had time to ripen any further growth produced later, and if you leave it alone then and do not cut down cutting simply prunes it and if it is a strong plant with plenty of roots it will simply throw up more shoots than the one you have cut off. There may be four or five stems for each one you cut down, and these will produce enough leaf growth in a short time to go on with their business of feeding to lay up food in the root-stalks to supply ample nourishment for the flowering stems of the following season. This is one of the general principles of plant life which we must remember in fighting perennial weeds. If perennial plants root near the surface of the ground, these roots should be turned over and exposed to the air and sun, which will destroy them. If they are deep rooted, we can only destroy them by cutting them off at the top and destroying the leaves that feed on the air, and follow this up by keeping on cutting

them down, thus preventing the leaves from laying up a store of nourishment in the roots.

As to the best time for ploughing, there are two ideas which we must bear in mind. A plant which produces its flowering stems at the expence of material laid up the previous year is at its weakest stage when it has produced flowers but has not had time to lay up another provision of nourishment. The whole object of the active growth of a plant is to produce seeds; it keeps on feeding and laying up nourishment, and directly it has grown to its full growth, its flowers expand and then its business is to ripen these seeds and the food for this is taken out of its own stem; after this the plant keeps on feeding with its leaves, but the distribution of this prepared food is in the opposite direction, viz., down the stems to the root-stocks for the use of the next year's growth. In fighting against deep-rooted perennial weeds such as the Canada Thistle, the plants should be ploughed down either when they are in their weakest condition or later on in the year when from the heat or lack of moisture they have little chance to recover, so that it is a question either of fighting the plant in its weakest condition or when the climatic conditions are strongest against its recovery. In other words, plough when the plant is weak or when the climate is so hot and dry that the plant has no chance to recover. With some plants turning them down deeply at the time of most active growth gives good results, the succulent new growth decaying quickly for lack of air. In the case of Indian hay, which is a very troublesome weed, the two methods which have given the best results are to plough directly before the seeds are ripe, this is in May, because the flowers are produced very early indeed, and towards the end of May the seeds are ripe, or wait until the hot dry summer and then plough it deeply, so that it will dry out and have no chance to recover. It is always a good plan after ploughing down these deep-rooted perennials, if your rotation will allow of it, to sow the land with some thick growing crop which will smother out any late growth which may be produced. Of course in the East root crops which require frequent cultivation will answer, as all the shoots that come up are cut off by the cultivator, and after that the growth of later shoots is prevented by being crowded down by the foliage of the root crops. In the West, where they do not use such a large amount of roots as we do in the East, because they have not enough stock to eat them, these weeds can only be kept down by summer fallowing for the double purpose of holding in soil moisture and cleaning the land of weeds.

*By Mr. Featherston:*

Q. In summer-fallowing you do not mean to say deep ploughing is done?

A. Yes; the ploughing is done tolerably deep and the plough is followed immediately with the harrows so as to dry up the surface and prevent the moisture from evaporating. After the ploughing which should be done in June, the surface is harrowed two or three times to prevent any weeds from ripening seeds.

Q. Keep them down during the months of June, July and August?

A. Undoubtedly, keeping down and destroying all seedlings which may appear and all growth from perennials, so that they never get a chance to recover.

Q. Keeping them from getting food from the sun and air.

A. Yes.

*By Mr. McNeill:*

Q. When would you do the cultivating with the weeder, before the leaves are completely formed?

A. When the wheat blades are about one or two inches high.

Q. And when should thistles be mowed?

A. Just before the full growth, as soon as the flowers open, when they have drawn out the largest amount of food from the stems and have not put anything back from the leaves.

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## STINK WEED—THE USE OF WEEDING HARROWS.

*By Mr. Richardson :*

Q. Have you the Stink Weed in Ontario ?

A. Yes.

Q. To a very large extent ?

A. No; not to a very large extent, but it is found occasionally all over the country. It was introduced from Europe many years ago, and when I say we have it, while it is not abundant, there are probably few places where you could not find it by looking for it.

Q. It is becoming a most prolific weed in Manitoba ?

A. It has so become, I am afraid. Those people who have used the weeders or light harrows have met with great success at Emerson. Have you been down there lately ?

Q. Yes.

A. You will remember, then, how both sides of the valley were overgrown with it; it was just like a green sward. I have seen several clean crops near Emerson where weeders and harrows were used in spring.

Q. Did they give up summer fallowing ?

A. No; they operate the weeders after the grain is well up in the spring. Mr. Fraser, one of the best farmers there, has harrowed a great deal during the last two years. Directly the grain is up, when the weeds are less than an inch high, they run the weeders or light harrows over them and destroy myriads without injuring the wheat. Mr. Young could tell us something about the success of this practice.

Senator Young.—Yes, that is right.

Mr. FLETCHER.—The weeder is a comparatively new implement, somewhat of the same appearance as a hay rake, only with three sets of slender teeth which, instead of hooking forward, slope backwards. When drawn over fields of growing grain these stir up most thoroughly about an inch of the surface of the soil, pulverizing it and leaving it loose, so that you get the advantage of cultivation among the growing crops. They do not tear up the growing grain to any injurious extent, and they cultivate the whole of the weeds, so that on the land that is treated by the weeder you will see in a week a great difference in the crop. As an illustration of the advantage of the use of the weeders, Mr. Nicholl, a progressive farmer of Brandon, reaped thirty bushels of wheat to the acre, while his neighbour had only fifteen bushels on exactly the same kind of land.

*By Mr. Calvert :*

Q. What is the best way to treat mustard ?

A. With a weeder. The weeder keeps down the mustard. Therefore, I say it is far better farming than adopting any method of spraying sulphate of copper or other chemicals over the crop, which, although they will kill the mustard, are expensive and tedious. You can go over thirty or forty acres per day with a weeder.

*By Mr. Featherston :*

Q. The weeders are very wide, are they ?

A. They hitch two loosely together, and use two teams of horses. I have tried to get some implement maker to make a sulky weeder, with wheels and a crank to raise the teeth to clear it like a hay rake.

## CROP VALUE ENHANCED BY WEEDING.

Q. Massey's have a sulky weeder now ?

A. They had not last year, they were one of the very firms I wrote to and asked them if they could produce one. I believe the salvation of the West is really

to be found in this weeder question alone; I have seen such remarkable results from harrowing and weeding. The advantage is not only in the increase of grain reaped, but also in the absence of weed seeds from the grain. It is a business matter. A man who is buying wheat looks at the sample. He sees it is a good sample, but if he finds the seed of weeds in it he says 'It is pretty weedy isn't it?' As a matter of business he tries to buy at the lowest figure and will take advantage of any excuse to reduce the price he offers. The farmer will get better prices with less trouble in handling it when his wheat is free from weed seeds, and the whole country will derive a benefit. The use of weeders is, I believe, better farming than spraying and of greater value to the crop than any other method suggested as a substitute. I spoke at some length on this subject last week, so I will not delay the committee longer now.

*By Mr. Featherston :*

Q. I have tried the harrow and found that it never hurt the crop; a big heavy diamond harrow?

A. Yes. An argument in favour of harrowing is the well recognised benefit that operation is to a crop of Indian corn. Is there a man in the country, to-day, who does not harrow his corn after it is up? Some years ago, if any man had harrowed his corn people would have said he was crazy, but to-day they would be more apt to say it of the man who did not harrow his corn.

*By Mr. Richardson :*

Q. Of course the harrow won't do in rocky land?

A. No; the method is particularly applicable in the West, where the land is light and free from stones; but in some of that wild rose country I referred to, they have had good effects from using the weeder, notwithstanding the bother given by the woody roots of the roses.

*By Mr. Bell (Addington) :*

Q. You cannot harrow any land in crop that has rolling stones on it?

A. Certainly not.

#### RIB GRASS.

*By Mr. Erb :*

Q. I would like to ask if anything could be done for the Rib Grass in pastures; that is, permanent pastures that you don't want to plough up?

A. Yes, I understand. I don't think there is anything you can do. Of course sheep like the plant. It is a perennial plant which roots close to the surface, and if ploughed down and the land reseeded, it would be clean for some time. That is the only treatment I can suggest. The seed of this plant is generally introduced in clover seed, and I am afraid it is spreading in the country through that means. You find the seed quoted for sale in many of the English and French catalogues, where it is advertised as a crop for sheep, and these animals certainly like it; it is a troublesome weed, however, where clover is grown for seed.

*By Mr. Cochrane :*

Q. Is it not a fact that the seed of the Ox-eye Daisy will lie in the land for a number of years and not germinate?

A. I do not know that about the Ox-eye Daisy, but I know it is true in regard to mustard.

Q. I know if you have a field with Ox-eye Daisy in it, and cultivate it even with corn, and then seed it down, you will have Ox-eye Daisy again. I know as a fact that where the seed of the Ox-eye Daisy had got into a field and it was planted

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with corn, that the corn kept perfectly clean and then another crop was seeded down and the Ox-eye Daisy appeared, much to my surprise, in the field.

A. The seeds do probably remain in the land for some years, but the method of cleaning land by sowing with clover and timothy is very good, and farmers have told me that it has given good results.

Q. And then the sod broken up after the crop is cut?

A. Yes.

## LEGISLATION ON WEED CLEANING.

*By Mr. Rogers:*

Q. Do you think that the present legislation on weeds is strict enough?

A. Well, I think so; but it is not often enforced. When we find the present legislation is enforced, we can talk about new legislation. I am told by weed inspectors that it is very unpleasant work for a weed inspector to have to go round to some farmer neighbour and tell him that certain weeds need to be cleaned off his land. This farmer says, as a rule, 'Yes, I intend to get them out, but we have been very busy.' Then the inspector goes back in a week or so and finds the work not done, but the farmer says he has been very much rushed and he is going to get the weeds out next week. So long as a man says he is going to attend to it, what is the weed inspector to do?

Q. They have an Inspector in Manitoba?

A. Yes, but there the conditions are different; practically the crop of the whole country is wheat and farmers seemed to realize that the eradication of weeds was an important matter which all must attend to; and then another thing is, summer-fallowing is regularly practised by the best farmers; besides this there are fewer fences and fewer public roads—from which weeds spread—so that it is not quite so difficult to keep weeds under. Again in the North-west Territories they have a very strict law and it is well observed, for public opinion makes it even easier to do so there than in Manitoba.

The CHAIRMAN.—We have a very strict law in Ontario against the Canada Thistle that has been on the statute book twenty years, and where has it been carried out?

A. In very few places, I fear.

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Having read over the transcript of my evidence of March 1 and March 7, I find the same to be correct.

JAMES FLETCHER,

*Entomologist and Botanist to the  
Dominion Experimental Farms.*

