ANNUAL REPORTS

OF THE

FRUIT GROWERS' ASSOCIATION,

FRUIT EXPERIMENT STATIONS

AND

ENTOMOLOGICAL SOCIETY

OF ONTARIO.

1896.

TWENTY-EIGHTH ANNUAL REPORT

OF THE

FRUIT-GROWERS' ASSOCIATION

OF ONTARIO.

1896.

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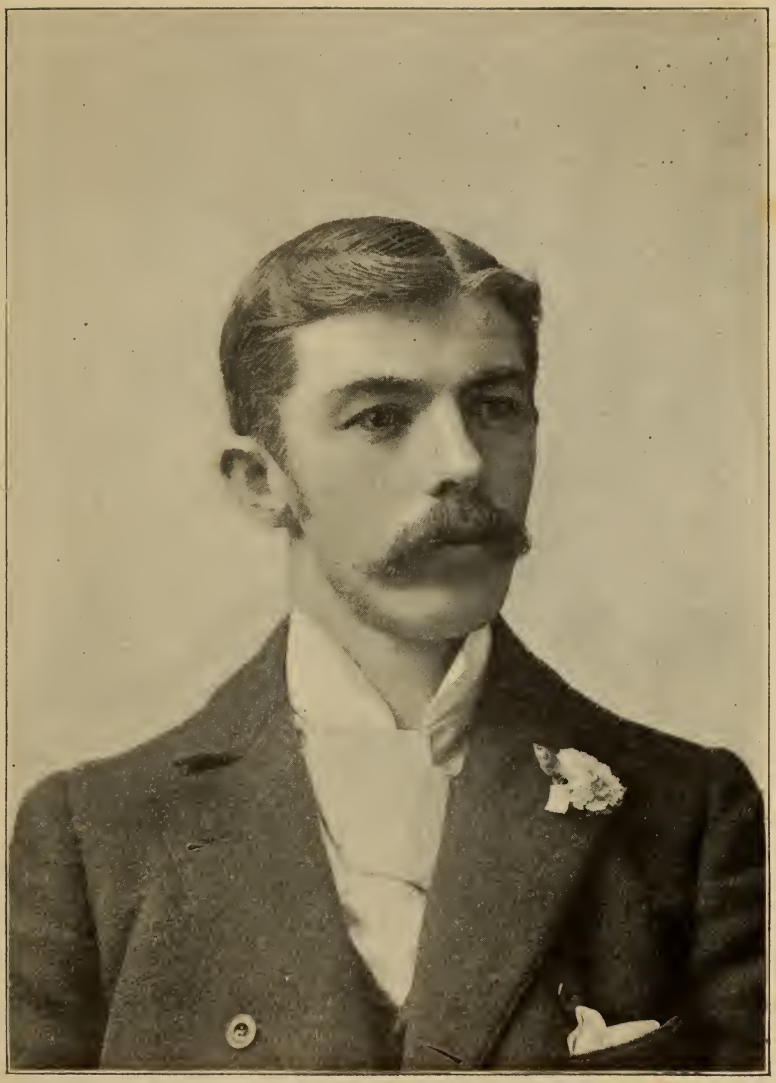
CONTENTS.

W. E. WELLINGTON, ESQ., TORONTO.

PRESIDENT FRUIT GROWERS' ASSOCIATION OF ONTARIO, 1897.



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Horticulturist at the Ontario Agricultural College, Guelph.

TWENTY-EIGHTH ANNUAL REPORT

OF THE

FRUIT GROWERS' ASSOCIATION OF ONTARIO.

To the Honorable John Dryden, Minister of Agriculture :

SIR,—I have the honor to present the Twenty-eighth Annual Report of the Fruit Growers' Association of Ontario. The meeting at Kingston, reported herein, was one of the most profitable in the history of our Association, and we believe it will mark a step forward in the fruit growing industry.

I have the honor to be, Sir,

Your obedient servant,

L. WOOLVERTON,

Secretary.

GRIMSBY, December, 1896.

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FRUIT GROWERS' ASSOCIATION OF ONTARIO.

ANNUAL MEETING.

The annual meeting was held at Kingston, Wednesday, December 2, in the Dairy School lecture hall, the first session opening at two o'clock p.m.

The president, M. PETTIT, of Winona, expressed pleasure at seeing so many present at the opening session, which promised a good meeting, and called upon

The secretary, Mr. L. WOOLVERTON, who read a telegram from Mr. Alf. Brown, Picton, regretting his inability to be present and read his paper; from Mr. Holtermann, of Brantford, calling the attention of the Association to breach of the law forbidding spraying fruit trees while in blossom by some fruit growers. Referring to the latter, the secretary stated that this Association is fully in accord with the Bee Keepers' Association on this matter, and will use its influence in endeavoring to prevent any transgression of the law on the part of the members throughout the Province.

The secretary also read telegram from the Minister of Agriculture for the Dominion stating that he would be present on Wednesday afternoon and deliver an address; also from the same, suggesting that the Association should discuss what tariff changes are desirable; also from Mr. Lockie, of Waterloo, inviting the Association to meet in that town next year; also letters of regret from Prof. Taft, Mr. Rice and Mr. Watkins of Michigan, regretting inability of be present; also invitation from St. Catharines to hold convention there next year; also from Whitby, inviting the Association there in 1897.

The secretary read the regrets of Mr. Anthony Copp, of Hamilton, at his inability to be present. The secretary stated that Mr. Copp and Senator Sanford were ardent advocates of the establishment of a station in London, England, for Canadian fruit. The secretary, the president, and some other of the fruit growers in the district near Hamilton had the honor of putting up some boxes of choice fruit for Her Majesty Queen Victoria, some of which, as mentioned in the newspapers, had appeared on Her Majesty's table. It was thought that this would be a good means of bringing Canadian fruit prominently before the English public. A letter received from the Dominion Department of Agriculture has been received stating that the award for the exhibit of horticultural literature at the World's Fair had been received, consisting of a medal and diploma. The judges considered our exhibit of literature unique, and such as was not exhibited by any other horticultural society. This diploma is not an ordinary one, as it has engrossed upon it the reasons why our exhibit was considered meritorious, as follows: "This exhibit consists of a complete set of the reports of the Ontario Fruit Growers' Association, and it is of a very high order of merit. It illustrates the extensive and progressive work of a wonderfully successful organization."

MR. THOS. BEALL suggested that all our medals should be exhibited at the annual meetings, so that the public might see what the Association had received in time past.

THE SECRETARY: We have a set of medals received at the Centennial, and medals received at the Massachusetts Horticultural Society and other places. We shall endeavor to show them at the next meeting.

THE PRESIDENT'S ADDRESS.

By Murray Pettit, Winona, Ontario.

Again we are permitted to meet and extend to each one that friendly greeting we owe to each other as horticulturists. All are interested in one common and grand industry, that of horticulture in all its various branches, an association less selfish than any other association, having only as our object the benefit of mankind, the building up of the Province in which we live, and the health and wealth of its people; for health is wealth. What association is to-day laboring more earnestly for this than the society of which you and I have the honor to be members, by encouraging the growing of fruits, flowers and vegetables, and ever advocating the doctrine that every land-owner in this Province, no matter how small, can have a fruit, flower and vegetable garden, thereby bringing health and happiness to his family? What is more elevating to humanity than the outgrowth of our industry? What more advances the wealth of our Province than the work in which we are engaged? What to-day has placed our beloved Province more in advance of the other provinces than the fact that fruit growing has become a success in all her borders, largely through the work of this Association?

Now that every home in our land can be fully and cheaply supplied with fruit, and an abundance for export, should we not turn our attention more fully and earnestly to better means of transportation and development of markets? The abundant crop and low prices of the past season warn us of the danger of over-production When we consider the fact that hundreds, if not thousands, of acres are yet to come into bearing, this is a question of great importance to the fruit growers of the Province of Ontario. Apple culture has engaged the attention of our association, at their annual meetings, for the last thirty years, new varieties continually claiming our attention, but it would appear to me that the time has fully come when the question of transportation and the development of new markets should engage our careful consideration. While we claim to be a progressive association, and welcome the advent of new additions to the already large list of choice varieties, we might now leave their development to our fruit experiment stations, where their true value, hardiness, productiveness, and quality, as well as their adaptability as to locality and soil, might be fully tested, and not, in our ambition to secure a mine of wealth in some new and untried variety, forget that almost millions of barrels are being produced now of exceedingly fine quality, the value of which might be enormously increased could we place them upon the markets of the world in proper condition and at reasonable cost. Thousands upon thousands of barrels this year are scarcely bringing freight and commission charges in the British market, and we ask ourselves can it be possible that after subsidizing railways and steamships for the transportation of our products we are now called upon to pay the total value of the product to these companies to carry them to their destination, or does the fault lie at the other end? That part of the transaction we do not see. Reports as to the prospects that reach us are very encouraging, but returns are most discouraging. Much fault is laid at the door of the packer, but this I cannot endorse as being general. We have before us to-day an object lesson, and one we might carefully study for our future guidance. Large quantities of choice apples wasted in the orchards. "Why?" Because of doubt and uncertainty in regard to the system of marketing on the other side, and, to add to the doubt, the increase in freight rates, which are usually made when the quantity to go forward is large. Let us analyse the matter as it has stood with many a shipper this season. Freight from, say Toronto to Liverpool, $1.07½ per bbl. by the car load; insurance, say 3c per bbl.; cable charges, 1c per bbl.; receiving, delivering, and sale expenses, etc., 18c per bbl.; commission, 5 per cent., this year, on selling price of say 8s. per bbl., 10c, and he has the respectable sum of $1.40 against him. Now, out of the small balance of 52c in his favor, there is one barrel to pay for, 28c; picking, 10c; packing, 10c; cartage, well, we will only charge half what they do on the other side, because we can do it ourselves, 5c, and we will throw in small items, such as nails, postage, telegrams, stationery, etc., for the sake of doing business with those large receiving firms in the Old Country, always remembering the

special injunction to "put in only the *choicest specimens*," otherwise the slightest neglect in this regard would bring discredit upon Canadian apple growers! We want a change in the present system, and you, gentlemen, fruit growers of Ontario, will need to solve the problem. Slack, wet and wasty are convenient terms too frequently applied, unless the product is towed across like a raft behind a scow. We see in the public press and from high authority in the land that cold storage facilities for the transportation of our fruit products will be put in proper shape before the next season's crop. I sincerely hope such will be the case. But one additional link will then be necessary to make the chain perfect and establish confidence with the producer—the establishment of a depot for the handling of Canadian fruit, and by one who has some knowledge and experience in Canadian fruit culture. This I consider all important, and his return to this country at the close of the season to report to the fruit growers the conditions that exist and the possibilities of trade in the future. At present all is uncertainty and doubt. "Distance lends enchantment to the view," but when we pause and reflect that our big English brother is to-day revelling in choice Canadian apples at cost of freight and commission, or less, it does not inspire the Canadian apple grower with much respect for the present system of handling the product. Up to November 30th the quantity gone forward from this continent was about 1,000,000 barrels, or about two quarts for each family living in the market boundaries to which they have been shipped, while in Canada the probable consumption would reach one bushel or more per family, which shows an almost unlimited market under proper conditions.

Spraying experiments were again conducted by the Department of Agriculture during the past year, and we expect valuable information from the report on this work. Now, it has been practically demonstrated to the fruit growers that spraying with Bordeaux mixture is an effective remedy for all fungus diseases. We think a careful system of experiments should be conducted, either in a similar way or by the Fruit Experiment Stations, for destroying the Codling Moth. Great improvements have been made by the manufacturers of spraying outfits, and in answer to the numerous enquiries continually being made as to which spray pump is the most suitable for general use, the Board of Control of the Fruit Experiment Stations of Ontario decided to invite a public trial of spray pumps, which was held last April, at Grimsby. Eleven pumps were exhibited, each being required to use one barrel of the Bordeaux mixture. The pumps and their work was judged by H. L. Hutt and your President on a scale of points as follows:

1. Ease of operation. 2. Evenness of distribution. 3. Compactness of style. 4. Durability. 5. Power. 6. Agitator. 7. Accessories.

The judges, in their award, class the pumps in three groups; group one standing as follows:

Spramotor, London, Ontario.

Eclipse, Benton Harbor, Michigan.

Anderson, Aylmer Iron Works.

Pomona, Seneca Falls, New York.

Medals and diplomas have been received, awarded on fruit at the World's Columbian Exhibition to districts and societies in different parts of Ontario. At the suggestion of the Honorable Minister of Agriculture, Mr. Dryden, these awards will be placed on exhibition and kept in the Parliament Buildings, Toronto, showing the great achievements of the fruit growers of Ontario. This arrangement we consider much better than having them buried in the private houses of the presidents and secretaries of the different societies. I would suggest that they be placed on exhibition each year, for a few years, in the Horticultural Department of the Industrial Exhibition, Toronto. It is a matter for regret that fifteen individual awards, after this long delay, have not been received.

Fruit experiment stations have been established during the past year, making ten in all, covering every section pretty fully, and, in a few years, the fruit growers of this Province should receive from them a great deal of valuable information. We think the

work of these stations should not be confined to experiments in varieties alone. Careful experiments should be conducted with the different fertilizers for a term of years from the time the trees or vines are planted. Also experiments in pruning, cultivation, spraying, and, in fact, everything that would tend to lessen the cost of production of fruit.

Through the patriotism of Mr. Anthony Copp, of Hamilton, the fruit growers of that section sent a collection of fruit to Her Majesty the Queen. Unfortunately it was not thought of early enough to send a good collection of summer fruit. Twenty-nine cases were forwarded to the Canadian High Commissioner, Sir Donald Smith, consisting of about fifteen varieties of apples, half-a-dozen of grapes, a few pears and quinces, and the following reply was received :

London, November 21.

The Canadian High Commissioner received the following note from the Queen's Private Secretary, Lieutenant-Colonel Sir Arthur J. Bigge, dated Windsor Castle : "I am commanded by the Queen to beg you to be good enough to arrange that Her Majesty's best thanks be conveyed to those fruit growers in the neighborhood of Hamilton, Ontario, who kindly offered, through you, for Her Majesty's acceptance, a beautiful consignment of their year's crop, which the Queen is glad to hear has been unusually large and excellent in quality. The cases were received yesterday by the Master of the Household, and their contents were in excellent condition, and some of the fruit served at Her Majesty's table proved excellent."

HORTICULTURAL REMINISCENCES.

By C. E. Woolverton, Grimsby.

[This paper was read by the Secretary, who stated that his father had been asked to read this paper because he was one of only two or three living representatives of the Association as first formed about the year 1860, and he was one of the constituent members at its organization.]

Truths of revelation, facts in science and art, development of mind and matter, are the right of no particular class, but are designed to be free for all. Therefore, every man ought to gather and distribute what he can for the well-being of his fellows, and for the progress of his country. He should learn from the running river, and not from the stagnant pool, which breeds miasma in all directions; from the merry rill, which gathers from many other streams, meanders through the meadow, swells in the vale, turns the mill, and bears on its bosom the ships laden with commerce to the broad ocean. Thus good men have travelled and collected knowledge of laws and art to bring home, and show their own people how to use soil and climate to better advantage. Pope said : "The fur that warms the monarch warmed the bear," and how much more may it be said of Mother Earth that she warms and feeds the rich and poor. God, who planted the first garden on the virgin earth, seemed to select from the fields the trees and vines, indicating that horticulture was of a higher grade than agriculture. The proverb, "Prepare the cage before you catch the bird," is verified in that God prepared the garden before he gave man a wife. Solomon said, "I made me gardens and orchards," and he reigned in peace when every man sat under his own vine and fig tree, using the plowshare and pruning hook instead of the sword and spear, and it seems as though the people would be more happy than the Athenians who spent their time in inquiring "What news?" Each savage owns the forest, but has no garden. The sluggard sleeps and neglects his garden, while the thorn and the thistle grow broader and higher. The cultivated garden indicates civilized man; here he may show a refined taste in fruit and flowers. England, by her position and sovereignity of the sea, has not only selected the best of all lands, but has also cultivated in peace the richest of them, and to us she may well be called the Mother Country, while the German speaks in similar terms of his "fatherland."

In the time of the Revolution some sterling men called U. E. Loyalists, settled in the Niagara District. King George gave them land in the wilds of Canada where nuts, plums and crab apples grew. They had read that one of the finest trees in Rhode Island sprang from a seed dropped in the grave of Roger Williams, so many tried the experiment of sowing apple seeds, but few apples of any size were produced, and the small ones were often gathered with the wooden scoop. About 1790 John Smith offered his right to 200 acres of land for a cow, but found no buyer; about 1798 he sold it to Jonathan Woolverton, my grandfather, for 40 pounds of York currency, and the said Smith gave five natural apple trees to bind the bargain. About the year 1830 there came a man from England, about fifty years of age and weighing about fourteen stone, and he called himself Peasley, the Grafter. He carried with him scions which he said would bear pound apples, full sixteen ounces to the pound. When at work he took his stand on a wooden chair, clothed in a huge jacket with pockets like the pouches of the kangaroo, in one of which he carried wax and scions and in the other grafting tools. After grafting in our neighborhood, he returned to the Mother Country, and after six years came out again. I remember his joy when he found his word true and saw the pound apple which he said was the Gloria Mundi. I thought of old Santa Claus with his grey whiskers and loud laugh; and "his little round belly that shook when he laughed like a bowl full of jelly." He hailed from England, but his port and bearing were of the German order. He came out in the reign of George III., and when he swore, it was "Py George," the then popular oath of the U. E. Loyalist; for the king gave them their farms, their government and their church: and that they might not fracture the third commandment, allowed them to swear by his name. He brought the Ribston Pippin, Pearmain, and English Russet. When Peasley's Pearmain, Ribston and Gloria Mundi began to bear, I took a load to Hamilton and supplied that village where Cary kept hotel and Stinson the principal store.

Dr. Beadle was selling trees from St. Catharines, and one Moore, a Canadian, brought a few pears and peaches from Rochester. Delos Beadle had graduated from the Grantham Academy and, I think, was studying law at Harvard. He afterwards took up his father's calling, and at his instigation the fruit growers met in the Chief Magistrate's room in the Court House at St. Catharines. About 1857 A. M. Smith appeared on the scene. He had learned the nursery business with Mr. E. Moody, of Lockport. Mr. Moody came over for Canadian evergreen trees, he stopped at Grimsby to give us some advice about raising peaches. He praised our soil and said he had only one objection to living in Canada and that was that then he could never be president of the United States.

When our Association met at St. Catharines, we were twice surprised. First, at the knowledge of Judge Campbell and Delos Beadle about fruit, climate, and soil, and secondly, at our own ignorance of the fruit we had handled for a term of years. The genesis of our Association budded in St. Catharines. Judge Campbell was the first life member, but did not live to see it bloom. Delos Beadle was the Moses of our exodus, leading us out of our ignorance into the present fruit-bearing stage.

The formal organization of our Association elected W. H. Mills, of Hamilton, as president. He was not of the mills of which it takes ten to make one cent, nor was he a wind mill to crack corn, but he honored the goddess Pomona by cultivating fruit and flowers, and at one of our meetings took us out to see how faithfully he raised the finest plums and pears by the sweat of his brow.

Charles Arnold had rather a set countenance and appeared somewhat cross, and he believed in cross fertilization of fruit and grain, but his crossness was something like the chestnut burr, only on the outside, for we never had a more welcome visit than at his residence when he invited the Association to Paris.

A. M. Smith and the writer were honored with a like visit at Grimsby, when we followed suit and invited the Association to our hearts and homes. I cannot forget the two who brought their wives to add to the sociability of the occasion, Mr. Holton and Mr. Hoskins, of Hamilton. It seemed at once to put a link in the chain of friendship which death alone could sever, and that only for a time.

In conclusion I may say that I have had the honor of being a full private member of this Association all these years, and have seen with pleasure its rise and progress to its present character, and the assistance it received from such noble men as Rev. Mr. Burnett, Wm. Saunders, Judge Logie, P. C. Dempsey and others. And I wonder why I, who have done so little to advance the work, should still live at nearly four score, while these useful men, younger than I, have been called away. But we bless their names for their works which follow them, and we hope to meet

"On the other side of Jordan
In the sweet fields of Eden,
Where the tree of life is blooming,"

where the eternal tree of life bears everlasting fruit, instead of temporary trees bearing perishable fruit only once a year.

GARDENING IN RELATION TO CIVILIZATION.

By Prof. Short, of Queen's University, Kingston.

When I was asked to contribute a paper or address to this Association I felt, of course, extremely flattered, but I felt also that I had really nothing that was worth contributing to gentlemen who were so well acquainted with the practical aspects of gardening, fruit culture, and so on, and I was therefore at a loss to know on what subject I might address the Association; but being a lover of gardens and a reader of history and a student of civilization, I thought that possibly I might select something which would enable me to approach you more in my own line. Therefore I thought that possibly I might throw some suggestions before you of a historic nature, dealing with the relation of gardening to the progress of civilization. I may take as the text of my remarks the statement by that eminent philosopher, noted scientist, great statesman—and, I am sorry to add, great political boodler—Lord Bacon, once Chancellor of England. He said, in one of his inimitable essays: "God Almighty first planted a garden, and indeed it is one of the purest of human pleasures. It refreshes the spirits of men, and without it, buildings and palaces would be but mere gross handiwork; and a man shall ever see that when nations grow to civility and elegancy, man comes to build stately sooner than to garden finely, as if gardening were the greater perfection." And indeed the remainder of this essay is an extremely good illustration of this fact; for while it expresses the science of the new development in gardening of the Elizabethan period, yet it does not express that perfection of gardening which the architecture of that period expressed in the stately mansions which were then rising all over the fair British land. But although I shall return to that period as an extremely interesting one in the history of gardening, let me briefly refer to some of the earlier stages. Now, civilization is something which, in its origin, is shared by the few. The great mass of men in the early stages know little or nothing of the forces which are leading them on. They know only that which interests them immediately, but not the final outcome of that, nor the bearing of it on their future development. Only kings and princes, slave-masters and so on, know or have a glimmering of what is meant; and those are the men in ancient times who build palaces, plant gardens, rear fancy animals, and in general lead the lines of civilization. Later on, when we find an aristocracy rising, we find these men surrounded by others who are equally interested in such things, and who become the patrons of art and the leaders of civilization; and the great merchants and the great traders and politicians, and so on, come to be the leaders of humanity and carry on the progress of man. And then, of course, when we come down to our modern times, and begin to recognize what democracy means, and the spread of this thing abroad, these things come to be shared by the common man; and it is one of the chief features of congratulation of our modern civilization that it has carried forth to the common man, to the ordinary citizen, the opportunities and privileges of civilization; that he can now have a

garden of his own, especially on this side the Atlantic, and that he may rear in that garden things which would have been the despair of kings and princes in former centuries. We find from ancient history that the Persians were among the first to develop a great civilization, and they were among the first to develop gardening. I refer to the Persians in particular because from them western Europe, through Greece and Rome, obtained the chief flowers and fruits which were familiar in that part of the world from the time of the Persians down to almost the present century. England, as I shall point out afterwards, has been one of the leaders in developing the condition of horticulture, agriculture, and everything else, beyond that point. We read in Xenophon, for instance, that the great Cyrus in his journeyings about was careful to have a paradise, that is, a garden, established at the various places where he made his permanent or semi-permanent residences; and those gardens were furnished with pears and plums and peaches and apricots and things of that kind, which came to be the favorite and permanent fruits of Europe. They were also supplied by the various kinds of vines and climbers, the rose, the violet, the iris, different kinds of lilies, and a few other flowers; but the range was extremely limited when compared with the enormous range of the present day. I need hardly refer to the contribution of Egypt, which was very considerable, towards the development of agriculture and horticulture, too, in the growth of flowers, because, so far as it seems to have had an influence in developing Europe, it came after the Romans had conquered it; and although there was a good deal of fruit grown in many of the districts by the Phœnicians, still they do not seem, so far as any records we have or that I have been able to discover, at any rate, to have carried with them much of their gardening operations. The Greeks, who obtained most of their arts from the east, and who seem to have developed gardening along the Persian line first, were very particular in arranging their gardens artistically. In other words, the Greeks put a polish on gardening as they did upon literature, art and philosophy, and brought it to a much higher perfection than it had ever enjoyed before; and that they must have used forcing green-houses or something of that kind, is quite evident from the fact that we find in commercial records of Greece that flowers such as violets were sold in abundance in the Athenian markets in midwinter; but just how they managed to produce them is not quite certain. When Rome came to swallow up Greece, and to sit at the feet of her Greek slaves for learning and knowledge and so on, Rome brought with them from Greece a knowledge of gardening; and the Romans, in their own sumptuous and gorgeous manner, with the pillage of the world, you might say, at their feet, went into gardening on a extremely grand and extensive scale. They incorporated into it, for perhaps the first time, an extensive architectural element, and a great feature of the Roman garden was its architecture, its fountains, its terraces up on the hills, the cascades, the immense plazas, stairways, balustrades—and all of these ornamented with the most expensive and delicate and often artistic statuary. Some remnants of those ancient Roman gardens are still to be found. Up on the hills, where the wealthy Romans had their country houses, and—most astonishing of all—out over that malarial district around Rome, through which the Appian Way passes—a place which was originally an extensive and malarial and poisonous marsh, but which the Romans, from the remains which are discovered there to-day, evidently converted into a suburb containing the richest, most expensive and elaborate palaces that the world has ever seen, in proportion to the ability and the extent of the people. These palaces were each surrounded by beautiful gardens; and the Romans managed in some way to control the malarial features of that region, and to convert the rich alluvial tract into a garden capable of producing the finest fruits and the finest flowers. But the Romans, like a good many other people who become suddenly rich—who are sent out, say, as poor governors to distant provinces and come home laden with spoils which were not all honestly obtained—went to work to expand these by means of their riches, and therefore there crept in a very extensive element of vulgarity, and the consequence was that they began to imitate nature, or rather, try to make nature imitate art. They built artificial mountains and artificial terraces, canals, and all sorts of things out on the plain territory, and thus led nature captive, as it were, after the ideal of human art. I hasten on now to the period succeeding Rome. It is an extremely interesting thing to go into the details of Roman garden and fruit growing, and so on; but I want to refer to that

which brings us most nearly to England, and that is the period of the next great development after the fall and decay of Rome That was obtained in what is known as the Renaissance; but the Renaisscence only brought to life again the fragments of Roman civilization which had been maintained in the monasteries awaiting the period of the decay of Rome and the beginning of an extensive civilization on the new basis. The church, the dignitaries of the church, and especially the monastic institutions, kept within themselves these fragments of civilization, of literature, of science, of art, and so on, and among them the element of gardening; for they retained that method and system which was the science of the Romans, and also spread over Europe the trees, shrubs and plants which the Romans had obtained from Greece, and the Greeks from the Persians Now, the Renaissance generally was simply a period in which the seeds—these fragments, these ideas that had been husbanded and kept—burst forth from the monasteries once more, were taken up by the common people, and extended with extreme rapidity over the country. But I should hardly say common people; they extended quite to the common people, because the masses did not change very much in this period, and that is one reason why it was so short-lived—this blossoming of the gardens of Italy during the Renaissance period, particularly those supported by the great houses of the Medici and others of those who lived around Florence and Pisa and Milan, and so on. Those were the wonder of the world; and in no respect did that remarkable development of art find a higher or more beautiful expression than in those magnificent gardens; and one of the finest things about them was their extreme artistic effect—because some of them, in a somewhat dilapidated and fragmentary condition, remain to this day, and may be seen as exhibiting the finest features of artistic combination of architecture with gardening. From northern Italy this love for art and letters and statesmanship and so on, and with it gardening—though, as Bacon says, always after it, the finer, more delicate process, apparently—swept over the western part of Europe; was taken up by France first; from France spread to the Low Countries; then to Germany and to Spain, and so on—because Spain had really at an earlier time shared in the magnificence of Rome to a greater extent than the other countries of Europe; and from France and Holland it passed to England, mainly at the time of the Tudors, and found its first magnificent expression in the reign of Elizabeth after the troubles which had attended the Reformation in England had calmed down. Before this period in England there had been gardens; but they had been small affairs, confined to the castles within the moats, because although England began to expand in the time of the early Edwards beyond their castles a little, yet the Wars of the Roses and the troubles with France shut them up again, and the consequence was that nobility, civilization, letters and everything of that kind was walled in by those great castles, and placed in situations which were favorable for military defence rather than for the development of civilization. This is why it is that there was little opportunity for the development of gardening in England until the time of Elizabeth; but in the time of Elizabeth the gardens and the houses and so on crept out from those moated castles and strong walls and began to spread over the beautiful valleys and hills and country of England; and in no part of the world could they have found, with the facilities then at hand, a more beautiful region in which to expand themselves. Now, the first development of that gardening in England of which this essay of Bacon's from which I first quoted is one of the finest expressions, is characterized by two features distinguished by the sources from which they came. The people of Holland, according to their national proclivities, seem to have gone in for the cultivation of bulbs and bulbous flowers, in a somewhat formal manner, and everything was made after the fashion of tarts, mud pies and that sort of thing, and everything to this day has been characterized by extreme formality, dreadful in design, and unattractive in delicate matters, rather than presenting a broad and fine effect. In France we have another national characteristic expressing itself in their gardens—the love of display, of spread, of art in the formal rather than in the natural form, and the consequent development of architecture as an essential feature—the last crude expressions of which you have in the magnificent waste of lands in the Garden of Brussels—because there you have, as an English writer very well expresses it, an immense attempt to garden a whole township, as it were, and the consequence is that you lose all the effect which is obtained from this idea carried out

on a small scale—as though a man were to attempt to build a cottage of the size of Windsor Castle. Well, England took over these two features, because her commerce and intercourse were with France and with Holland; and the consequence is that the gardens of that period represent a sort of combination of those two elements; and also they run in two different lines, that is, some of them following the Holland idea, or the Dutch idea, and some of them following the French idea. Not, however, till the seventeenth century did they begin to develop some of the ideas of their own, and then during the eighteenth century they began that conflict which is continuing to this day in England and America—the conflict between the formal garden and the free garden, as they are called. This conflict comes down to the present time. Now, just a word or two about the nature of that, because that is perhaps the only practical outcome of what I have to say. The question upon which this strife turns is the question as to what the merit and use of a garden is—and here I am speaking of a garden particularly from its artistic point of view, not so much from the point of view of utilitarianism, although I cannot see any reason why you should call the production of fruits and vegetables which supply the physical and lower wants of man as any more practical than the presentation in a garden of the higher artistic features which supply, in far greater degree and in far greater prominence, the highest aspects of man. Surely that is as practical as the other; and it is that with which I wish to close in making a few general remarks. The point with the formal gardeners was this: that unless you train nature down into set and definite ways, and trim your hedges and flowers and so on, and trees, into ornamental shapes—pyramids, columns, even into the figures of animals and birds and that sort of thing—you are not really improving on nature, and you are not making nature express the highest possible amount of artistic effect of which it is capable. The free gardener, on the other hand, claims that unless you leave nature to follow her own sweet way, and simply enable her to do so to the greatest possible extent, you are not realizing the highest artistic effect. Now, it seems to me that there is a compromise, or at least meaning in this. Each one, to my mind, expresses a half truth, and it consists in this: that certainly with reference to the cultivation of flowers and trees and so on, and their arrangement, we are after the essence of natural beauty; but nature, in this as in other respects, in other forms of art, does not express to us, or turn out to us, in concrete shape, all the phases of her natural beauty altogether; and I am not such an ardent admirer of nature in the abstract as to believe that nature is always beautiful, because I have seen some things in nature that if one were confronted wish them for a very long time would simply have a tendency to drive one mad. Therefore I believe that the extracting of the beauty from nature consists in taking the beautiful phases of nature and bringing these as closely and in as great variety within human ken and within human influence as possible. Now, in so far I agree perfectly with the idea of the free gardeners, that nature's principles, not man's principles of art, must lie at the basis of gardening, and that all man can do is simply to coax nature, to systematize and to arrange nature, but to give nature in the arrangement perfect freedom, and added opportunity if possible, to expand herself in color, in shape, in shade, and all that sort of thing; and from the fact that man has himself been produced, as it were, and grown up in the face of nature, so the earth shows to man, when it is cultivated wild, a natural thing and not an artificial thing; and we should therefore go to those who have lived in the presence of nature, and not to those whose ancestors had been born and brought up in cities for generations, to find what are the principles of gardening art. On the other hand, the houses and buildings about which these gardens are to be arranged are expressions of architectural art—a wholly different art, resting on natural principles of course, the natural principles of physics, of dynamics, and the conditions and the laws of gravity, and the nature of material, and so on That is the fundamental element in architecture, and none of these must be violated without destroying all the after effects of architecture. Given these, the next range of elements that must be respected are human comfort, human convenience, the purpose for which the structure is constructed, whether it be municipal, state or domestic. Now, the last element in architecture is the ornamentation; but the ornamentation must not obliterate, contradict, or infringe upon any of these other requirements, but simply supplement them, beautify and render more perfect the fundamental elements as

they come upwards. Now, the garden is to surround these structures. The structure itself obeys these hard and fast architectural and stringent laws; and the garden is of the freedom of nature, you see—but there must be something to make the transition from the one to the other. The consequence is that it is an absolutely necessary principle that some compromise must be made in the immediate neighborhood of your building; that is, that the elements of gardening—borders and walks and shrubbery and so on, in the immediate vicinity of the house—must conform to the laws of architecture, and must therefore take on a more or less formal element, but the further it recedes from that, the more freedom it can be given, until in the outskirts it is given most absolute freedom. And thus we get what I take to be the most perfect and reasonable adjustment of the two conditions. But nature being able to present us with such an immense variety—a variety which in the species and genera of plants which are now placed at our disposal by the discoveries of men in all the different parts of the world, and the enormous facilities for transportation which enable us to bring them from all corners of the world, and to understand their conditions, and so on—enables us in the same area, with a little care and adjustment, to produce all varieties and kinds of plants, or at least an immense range of them, taking your glass houses as well as your open-air gardens; and the consequence is that if you set out with the formal idea of gardening—such an idea as will put them all in one place, in one square—it is quite obvious that you cannot cultivate any more than are suited to that one spot. But, given the variety of soil and situation and plant, and so on, it does not follow that our gardens must be on the same principle or plan, but you may get in the same city an immense development of loveliness, as it were, and love of beauty, and understanding of nature. But when we come to our public parks—and here is where the difficulty comes in—the architectural element has vanished, unless, indeed, there are architectural structures in it; and the nonsensical element in most public parks is the fact that people insist on treating the flowers of the parks in precisely the same way as you would treat the beds nearest to the house, and these go in for top-airy work and all sorts of nick-nacks and a carpet garden such as finds extreme expression, and an immense waste of means and labor, to the utter vitiation of the public taste. Don't believe that when a man comes along and opens his mouth in wide astonishment at some latest production of carpet gardening, and some monstrosity that is causing nature to imitate some form of human device, that that man is being benefitted. Not at all. He is opening his mouth with the same sort of sentiment and feeling that a man has on looking at a two-headed calf or any other freak of nature. Here is something that excites curiosity, but is rather degrading than elevating; and that man is not helped in the slightest by what he sees there, to go forth and appreciate nature, but he is helped much in the opposite way, and he goes forth and he looks on nature outside and he says, "Oh, it's rough, its miserable, it's not well kept, it's not well combed or curried," or something of that kind; and he goes back and gazes on that extreme formality and childish work. If, then, our civic gardeners and our municipal gardeners generally, and others could be brought to see this difference, and the realm in which the two elements work, we might have much greater beauty in this country and in other countries than we have; and I believe the few suggestions I have made may not be out of place in that line. (Hearty applause.)

Mr. HUTT, of the O. A. C., Guelph: I am sorry I came in late, but I have enjoyed very much what I have heard of the address. There are a number of ideas brought out with great benefit in our city and town parks. I was pleased with the park in Kingston, where they have been letting nature have full swing, or assisting nature so as to produce a fine effect. Great good would result if farmers and fruit growers gave more attention to this subject. We cannot go into the country without seeing the great lack of attention paid to landscape gardening and the beautifying of our surroundings. No one has a better opportunity than a farmer to beautify his surroundings, as he has plenty of room for it. They often make the mistakes of having some fancy little flower beds instead of green sod or tastefully arranged trees, and the flower-beds are not seen much farther than the house windows. I was struck with the professor's idea of the conformity of the landscape immediately surrounding the buildings to the buildings themselves. We see

around country houses a fence that would make a good chicken yard if put in some other place, and these unsightly fences go a long way towards spoiling the appearance of the house. (Applause).

The SECRETARY: I do not see why all our fruit growers particularly cannot make their surroundings very attractive, somewhat after the suggestions made by Prof. Short. They are always planting trees and orchards around their places, but too often they set them off one side and fence them in by themselves when they might be made an extension of the surroundings of the house. They would form a good addition to the house-yard, and the land and garden surrounding the house might gradually unite with the orchards which surround them, and not be shut off by those palings or tight board fences we often see.

FERTILIZATION OF FRUIT TREES, AND SOME CAUSES OF FAILURE.

BY PROF. FOWLER, OF QUEEN'S UNIVERSITY, KINGSTON.

The professor first showed a model or diagram of flower, and described its parts, calyx, corolla, stamens, anthers, pollen, pistil, ovary, etc. The stigma, he explained, is without epidermis and always moist, the only part of the organism which exposes living tissue. After describing its action and the effect upon it of external agents, he described the process of fertilization, and said:

To understand or explain the process of fertilization we must notice that the pollen grains of different plants are of different forms and of different sizes. So distinct are they that any one accustomed to examine them carefully can tell at a glance the kind of plant to which any specimens of pollen grains that may be presented to him belong. The grains may be smooth, rough, dotted, covered with prickles, ridges, etc., and they may be dry or moist, attached to each other, or light and separate. Each grain is covered with two coats or membranes, the outer coat being perforated with one or more pores or openings. In the pollen of wheat there is one pore, in the Evening Primrose there are three, and in some plants the number reaches eight. When a pollen grain is placed in water, especially if the water is sweetened, it swells by the absorption of the liquid; its membranes expand and the internal one protrudes through pores in the outer one. (A diagram was shown in illustration). When one of those grains is placed on the moist surface of the stigma, it absorbs moisture and begins to expand, the interior membrane gradually pushes its way through one or two of the pores in the interior coating in the forms of delicate tubes which lengthen by degrees and penetrate the substance of the pistil. Each tube elongates and grows by absorbing nourishment for the pistil and insinuates itself into cellular tissue of the style, and traversing its whole length, penetrates the ovary and comes into contact with the ovules or young seeds. Each ovule possesses a small opening (the micropyle), through which the pollen tube passes till it reaches the embryo sac, into which its contents or a part of them containing germinative cells pass and produce the effect which is called fertilization. In many cases a few hours or days are sufficient for the pollen tube to reach the ovule, but in some plants months are required. The ovule now acquires a new character and begins to grow.

In some cases the ovules may grow and attain the size of seeds without being fertilized, but they have within them no living germ and are incapable of independent life and growth. Unless they receive the germinative cell from the pollen tube they soon wither and die. This point I wish specially to emphasize, that without the action of the pollen, no seed would set and no fruit be produced.

Our next point is how does the pollen reach the stigma? (The professor here illustrated the difficulty on the diagrams.)

The botanists of the last century and the first sixty years of the present one held the belief that the adjustments in flowers possessing stamens and pistils were such on the whole as to secure the application of the pollen to the stamens of its own pistil. It was

acknowledged that great difficulties were encountered when efforts were made to explain the process by which the pollen reached the stigma, but the fact that the two organs, stamens and pistils, existed in such close proximity, and the further fact that the stigmas were fertilized by the pollen generally, silenced all doubts about the matter. In 1862 the view that every flower was fertilized in its own pollen was completely disproved. It is now held that a few flowers are so fertilized, but that the great majority are cross-fertilized. There are structural arrangements in most flowers that absolutely prevent close fertilization. (1) As examples we have poplars, willows, etc., which have their stamens or male flowers on one tree, and their pistils or female flowers on another. This necessitates transference of the pollen from the one plant to the other, as without this no fruit or seed would be produced. (2) Again most of our forest trees, oaks, elms, birches, beeches, hickory, hazels, etc., have the male flowers on one part of the plant, and the female flowers on a different part. The Indian corn has the male flowers at the summit of the stem and the female flowers near the base. (3) Again in very many plants the male flowers mature their pollen before the female flowers are in a receptive condition, or on the other hand the female flowers ripen first and the staminate a few days after. In each of these cases the pollen must be carried in some way from the stamenate flower where it is produced to the pistillate which is ready to receive it.

With these difficulties in the way how can the plant be fertilized? How can the pollen reach the stigma? It is a case of do or die. Nature has secured the necessary agents for the work. Of these there are two which perform the greater part of it and are constantly seen attending to the duties assigned them at the proper season. These are: (1) Winds; (2) Insects and birds. Broad lines of demarcation separate these two classes of plants. Those trustiug to the wind to bring them the needful pollen require no alluring displays to attract the breezes. They have small and inconspicuous flowers, presenting no light or attractive colors; they are destitute of fragrant odors and furnish no honey to reward the visits of insects. In further adaptation for transportation by the winds, the pollen is produced in immense quantities to allow for waste. The grains are also light so as to be carried by every gentle breeze, and dry and incoherent so as not to form heavy masses or to adhere to objects which might be encountered on its journey. The pistil-tips or stigmas of these plants are also especially adapted to catching and holding the grains of pollen blown upon them, as they are divided or branched into plumes or feathers and plentifully beset with hairs or bristles. The anthers also hang out to the air and wind only when just ready to discharge their pollen, and are suspended on suddenly lengthened capillary, drooping filaments fluttering in the gentlest breeze. Most of our forest trees blossom in early spring when the weather is seldom calm and before the leaves are sufficiently developed to interfere with the scattering of the pollen. They are native to the country and adapted to its climate, and consequently they produce their flowers in the most favorable season to secure cross fertilization. All grains, such as wheat, oats, rye, barley, Indian corn and all our cultivated grasses are also wind-fertilized, but they are all foreigners and they have been introduced by man. They are natives to other lands and are adapted for a different climate and are here exposed to certain disadvantages. A few fine, calm, summer days occurring at the time when they are ready for fertilization will prevent the transportation of the pollen and the harvest will prove a failure. Again, a few foggy or rainy days at the same time will equally produce the same result. The rain will wet the grains of pollen and carry them down to the ground, where they soon perish. Near the sea coast where fogs and continued rains are frequent, wheat is a very uncertain crop. From these facts it is very easy to see that a field of wheat which is ready for fertilization during a few fine days with gentle breezes will yield an abundant harvest, while another alongside of it which is not ready till a few days later when damp or rainy weather is experienced may be a comparative failure. Complete failure, however, will seldom occur for the following reason: The process of fertilization begins at the base of the head of wheat and gradually extends upwards for several days before it is complete. In the meantime several changes of weather may occur and one part of the head may be fertilized and produce good grains, while the top or some other part may be completely empty. Another fact worthy of notice is that if

two fields of wheat alongside of each other are ready for fertilization at the same time, the pollen may be carried from the one to the other by the wind, the one field will produce pure grain, while the other may be largely crossed or hybridized.

We now come to the most interesting part of our subject, which is to show the important duties performed by insects in the process of fertilization. All plants require ing their aid display certain attraction or hang out advertisements which mean "Good entertainment for bees and butterflies free." But where free lunches are provided some advantage is expected from the treat. The most prominent attractions are (1) Brilliant and varied colors, which render them conspicuous from a distance. All flowers admired as beautiful for their red, white, blue, purple, violet, lilac or other colors, or for the varied colors arranged in lines or dots are intended to catch the eyes of the insects and secure their attention. Expanded color surfaces are conspicuous from a distance, white and yellow being often very noticeable in the twilight. The different colors are adapted to the æsthetic tastes of different classes or species of bees, butterflies and other insects. (2) Odors of various kinds and in different degrees of intensity, are also allurements inviting the attention of insects. Some plants are only fragrant in the twilight when certain moths flutter round and visit them; some emit the odor of decaying flesh and appeal successfully to the blue-bottle flies and similar carrion living insects. (3) The real attraction, however, is the nectar, the sweet liquid which most flowers produce. The bright colors and the fragrance are merely the advertisements announcing the presence of the feeding places. When the nectar is concealed in some deep and safe recess where wet cannot injure it, many plants have lines or dots upon some of their petals to point out where it may be found, and thus save their visitor's time. What advantage does the plant derive from its elaborate preparation for the furnishing of free entertainment? The answer is easily perceived. The insect carries the pollen to the spot where it is needed. The great law of vegetable life is "Get fertilized, cross-fertilized if you can," and these are some of the means by which it is obeyed. (4) Another set of adaptations is conspicuous in these entomophilous flowers. The grains of pollen are mostly moist or glutinous, or roughish or studded with projections, or strung with threads so as not to be readily dispersed in the air, but to have some slight coherence as well as capability of adhering to the head and limbs or bodies of insects. The stigma is also fitted for the reception of the pollen by roughness, moisture or glutinosity. It is also worthy of notice that the bodies of insects are covered with hairs or bristles and rough excrescences, to which the pollen grains adhere till they come in contact with the stigma which is fitted to receive them. It is true that in the realm of nature that no one liveth to himself, not even an insect.

A few examples of the need of insects at the proper time may illustrate their work and its value. Orchards and gardens may be a mass of blossom, but without the aid of nature's laborers few apples, strawberries or raspberries and absolutely no melons or cucumbers will be produced, however favorable the weather may be. For example Mr. Belt, the naturalist, tells us that in his garden at San Domingo, Nicaragua, he sowed some scarlet runner beans. The soil was good, the climate was favorable for bean life, and the scarlet runners grew and flourished, and finally blossomed abundantly, but there their career ended. They did not produce a single bean among them, simply because the right laborers were not at hand to give the requisite help to secure fertilization. The garden was a new one in the forest, the beans were foreigners and the species of bee who understood the wants of the scarlet runners was absent from the district.

When clover was sowed in Australia and New Zealand at first no seed was produced,—the busy bee was not there to fertilize the flower. Prof. Huxley used to say that the quantity of clover grown near London depended upon the number of old maids. These venerable ladies kept cats, the cats wandered round and killed the mice, the mice destroyed the bees' nests and the young bees, and the bees fertilized the clover. Our fruit trees are dependent upon the bees and any agency which lessened their numbers would be felt in the harvest. Take another case. When the young gooseberries, or what should be gooseberries, wither and drop in early spring, instead of swelling as they ought to do, it is not so much because they have been nipped, but that the frost has kept

the bees at home. A few days too cold for the bees to pursue their labors when fruits are in blossom will often account for the failure of particular kinds. A few rainy days would produce the same effect. Strawberries are altogether dependent upon bees for the perfecting of their fruit. Each berry produces from 100 to 300 seeds, and every one of these must be fertilized that fruit may become soft, fleshy and sweet. The hard spots sometimes found on strawberries with the number of little seeds crowded together are due simply to the fact that the ovules have not been fertilized, and have withered instead of growing. Apples are sometimes deformed on one side for a similar reason.

Where birds are destroyed the insects increase to such an extent, and so many varieties of them seem to make their appearance, that they totally destroy the fruits in many places. For instance, Frederick the Great of Germany was a great lover of cherries. He had some very fine cherry trees, but he found that some birds were taking the cherries. He issued orders that all the birds should be destroyed, and the birds were destroyed in the whole neighborhood. Next year he had no cherries. The year following there was no fruit; and he was compelled to acknowledge that the birds had got the better of him altogether, and at great expense he succeeded in bringing back birds which kept the insects in check. When our little birds are being killed off the insects increase everywhere, and they will increase as long as birds are being destroyed. About thirty million birds are destroyed every year in Europe in order to ornament ladies' bonnets and hats. In the island of Sicily they destroy them in enormous numbers. When the small birds of Europe want to migrate to the southern climate of Africa during the winter, Sicily furnishes them a resting place on the way across the Mediterranean. They arrive there in immense flocks. The people in Sicily know about the day when they will arrive, and they have an ingenious way of hanging up hooks that are baited with insects to catch the swallow and little birds of that kind, the result being that in some parts of Ireland at one time it was impossible to raise crops owing to the number of insects that were being developed. In some parts of France it is the same way. However, they are getting over the destruction of birds now, and the crops are in many places better than they were. Down in the southern states of America most of the birds are killed off. In the island of Jamaica they killed them off altogether; the result was that insects were brought there that were never known before. Some species of tick came over in cattle and not only destroyed the crops, but annoyed human beings exceedingly. (Applause.)

Mr. HUGGARD (Whitby): Will pollen from the plum tree pollenize the pear tree?

Prof. FOWLER: I am not sufficiently acquainted with the practical part of the subject, but I hardly think it would. If it would, the fruit would be a hybrid between the two. I think a good many of those trees will fertilize one another to a certain extent—plums and peaches and pears—and you can get a cross between them, but they don't amount to much. In a place in France the children have a region where they fertilize different kinds of fruit trees that way, and they grow a very extraordinary kind of fruit. Different fruits would be on the same tree, because they fertilize from different kinds of trees—plum and apricot and so on.

Mr. MORRIS: Can the "yellows" on a peach tree be carried from the pollen of that tree and infect a healthy tree by bees spreading the disease?

Prof. FOWLER: I do not think that the pollen would affect it at all. I do not think that any disease would be carried by the pollen, because the pollen is newly shed on the body of the bee. The pollen sticks to the body of the bee, and he gets it from the anther where it is produced, and he lays it down on the stigma of the next plant that he visits, and I do not think there is any carrying of disease in that way, though I cannot be positive.

Mr. MORRIS: It is my firm belief that it is spreading in that way.

Prof. FOWLER: It would not be by means of the pollen; it would be by the germs of the disease getting on to the bee from that plant.

The SECRETARY: The question would be whether the little bacillus, the microbe, of that disease could exist in the pollen.

Prof. FOWLER: I hardly think it would, but I have not the practical knowledge to decide the question.

Mr. BURRELL (St. Catharines): I understood you to say that the strawberries depend almost altogether on the bees?

Prof. FOWLER: Yes, different kinds of bees.

Mr. BURRELL: I keep bees, and I have noticed very few of the ordinary honey bee, and very few of the humble bee ever fertilizing. Do not a large number of those syrphus flies fertilize?

Prof. FOWLER: Yes.

Mr. BURRELL: I see Prof. Erwin Smith is beginning to doubt the bee theory although it is very plausible. Anyway, we know that yellows is on the increase, and it has been decided that the axe and the fire are the only ways of curing it. On hearing that story of Frederick the Great we will all regret that he hadn't a spray pump.

Mr. CASTON (Craighurst): I watched very closely one year and did not see a single honey bee fertilizing; but I believe the bee that fertilizes strawberries is one smaller than the honey bee—I do not know the name of it.

Prof. FOWLER: Strawberries are native to this country, and were here long before honey bees were here, so that it is a native bee that must fertilize it.

Mr. CASTON: Yes, it is a native, but it is not what we call the wild humble bee nor the honey bee. It is a smaller insect that is very industrious, and that works all the time the blossoms are out.

The SECRETARY: I think we are very happily situated on this occasion by holding our meeting in the vicinity of Queen's College. We are very much indebted, I am sure, to the two gentlemen who have given us addresses, and we very much appreciate this one on cross-fertilization, because it is a line of study that we hope our more intelligent fruit growers will take up and pursue, because it is in this way that our new and valuable fruits are produced. In the history of horticulture in Canada there has been too much haphazard and chance work in the production of the excellent varieties that have originated in Ontario, with very few exceptions. We are happy to say we have had some gentlemen who have done some good work in this line, and to them we are very much indebted. I refer more particularly to Mr. Charles Arnold, of Paris, who was the originator of the Ontario—that beautiful and valuable commercial apple; and to him we are also indebted for some other valuable hybrids in other lines. I may also refer to the late P. C. Dempsey, of Trenton, to whom we are indebted for some very valuable apples and pears—notably the Trenton apple, the Dempsey pear, and others. I am glad to know there are others who are pursuing this line to a certain extent, thought not so largely ss perhaps they should be. I am glad to say we have with us to-day a hydridist who is an enthusiast, although not in the line of fruit; I refer to Mr. Groff of Simcoe, who has made a special study of the canna and the gladiolus, and who is very enthusiastically devoting a large portion of his time to the production of new varieties of gladioli. Therefore I hope this very interesting and valuable paper of Prof, Fowler's may be the means of stimulating some member of our Association to do some practical work in the line of producing new fruits by cross-fertilization, by understanding more scientifically the methods of hybridization. It is very important, I am sure, that these should be produced. It is only recently that we learned how important it is that the blossom of one variety be fertilized by the pollen of another variety. We have only recently learned that some varieties of fruit will not produce much fruit unless they are fertilized by another tree; and this is explaining the trouble with some of our barren orchards. We have large orchards of Northern Spy, for instance, that have not been producing, and possibly the reason is to be found in this fact, that the Northern Spy may not be able to fertilize its own blossoms. We have large orchards of Baldwins that have not been producing, and probably this is the reason; it wants cross-fertilization between the different varieties of apples. So with the different varieties of pears. It has been demonstrated that this is true with regard to pears; some varieties have been artificially pollenated with

their own pollen, and they would not produce fruit; but when they were pollenated with another variety of pear they would produce excellent fruit. We will be very glad if people are stimulated to think out along this line and work out these problems.

Mr. Groff: I am sure it is very kind of the Secretary to refer to my work, but there is really nothing for me to add. I would like to say, in referenee to the queries that have been put, that they show how limitless is the field for study and observation in natural things, and how great is the opportunity of any of the members who are here to have it said of them, as has been said of the late Mr. Fuller, "He learned from the open book of Nature, and the universities learned from him." (Applause.)

Mr. Race: I would like to ask Prof. Fowler or Mr. Groff if any hybridizer has actually seen the bee conveying the pollen—that is, if they have ever seen the bee or other insect loaded with pollen and conveying it from one flower to another? I notice from a German writer that that theory has been very severely attacked. This writer says that the only service they perform is by the use of their wings as a fan to distribute pollen in times of calm, when the wind is not doing that service, and that they have never yet been seen loaded with pollen. The same writer says it cannot possibly be, without a current of wind, distributed a very great distance by those insects.

Prof. Fowler; I think there are a good many thousands of observations recorded. For instance, Baldwin, in his work on cross-fertilization, expressly tells us that he examined the bees themselves, that is, caught the different insects, examined them, and found the pollen of certain flowers on them. (Hear, hear). He has seen those insects going from one flower to another, and has written down a good deal about it; and Baldwin was an exceedingly careful observer—very few men have been more careful. Of course, he might be mistaken sometimes in conclusions. There is another book, by Mueller, on cross-fertilization, where he gives lists of the insects that he has seen, and the plants on which he has seen them, and the plants on which they arrive carrying the pollen. It is a large volume, filled with observations that he has devoted a number of years of his life to. There is a little popular book—which is not quite so reliable, however—namely, Grant Allen, on the "Colors of Flowers," showing the value of the colors to secure fertilization by means of insects. Then every work on botany, if it is of any size, has a few chapters devoted to fertilization. Both Baldwin and Mueller refer to a large number of others for special observations. There is a little book called "Spraying of Plants," published by McMillan & Co., in New York, that gives the names of the insects that affect the plants, and the plants that are fertilized, and goes on with all kinds of spraying that have ever been used in the world from the old Persian times down to the present. I think those works show conclusively—at least, I have perfect faith in those writers that have devoted years of attention to the subject—that they have seen the bees going from one plant to another; and a special point is that if a bee sets out to visit any kind of flowers, he sticks to that special species the whole day. Bees have been watched by the hour going from one plant to the other, but he always goes to a plant of the same kind as the one that he has set to. In that way he fertilizes every plant as he goes along. If he went from one plant to a different one, of course his labor would be all in vain so far as fertilization is conccerned. (Applause).

Mr. Groff: From my limited observation the theory I have formed is that the bee carries the pollen, but that the pollen is mixed on the stamen and not on the stigma, and what we call natural fertilization takes place by the contact of the pollen and the stigma. It is not transferred to the stigma by the bee.

Mr. Race: Of course I was not heterodox myself, only I wanted to see what these professors had to say on that question; I saw that it had been attacked.

Prof. Short: When visiting a few years ago at my brother-in-law's fruit farm at Winona I happened to be there at the time when the grapes were in blossom, and he remarked that quite a number of valuable grapes often did not mature well in the bunches. I asked him to show me those—I think several varieties of Moore's Early and Worden and several varieties of the Rogers, and so on, were pointed out. On examination I found that the stamens on those particular varieties were extremely small, slight and

feeble, that they contained a very small quantity of pollen, that the stem of them was short, and that they did not apparently contain much. I spent about half a day observing the matter in order to make sure that this was not the stamen in the second stages of decay. Then I went to some of the other varieties that were said to almost always bunch well, and observed that the stamens there were strong and almost always longer than the stigmas. The bees then would naturally carry more pollen and fertilize more readily in the case of those that had strong blossoms; in the case of the others, not so. My idea was that if these could be assisted artificially by taking a feather duster, working it industriously over the strong flowers, and then striking it over the weaker ones, possibly it might help the matter. I did so, and at the end of the season my brother-in-law reported that that particular part of the vineyard had bunched ever so much better than the rest. (Applause).

Mr. MORRIS: The foxtail is better than a feather duster. That is what is used in the fertilization of tomatoes under glass.

Mr. ORR: And in hot houses for grapes.

Mr. PATTISON (Grimsby): Would it not answer just as well in the matter of grapes to plant a variety with strong stamens in close juxtaposition, say alternate rows, to those that have weak ones?

Prof. SHORT: I think that would be a good idea.

Mr. ORR: That is what we do.

Mr. PATTISON: I have found in my own vineyard that several Roger varieties, if planted in alternate rows, or alternately in the rows, with a variety such as the Concord or Niagara, will bunch very much better than if planted in blocks by themselves.

COMMITTEES.

The President appointed the following committees:

Fruit—Messrs. Race, Wellington and Hutt.

Nominations—Geo. Fisher and Mr. Race.

Programme—Executive Committee.

Resolutions—A. M. Smith, Mr. Beall and Mr. Orr.

New Fruits—Messrs. John Craig, H. L. Hutt and the Secretary.

The following three gentlemen were nominated by the meeting to be added to the Nominating Committee named by the President: Mr. W. H. Dempsey on motion of Mr. Wellington; Mr. W. M. Orr; on motion of Mr. Race; Mr. Scarff on motion of Mr. A. M. Smith.

Mr. WELLINGTON, on behalf of the Committee on Fruit, asked that larger accommodation be provided for the display, and this was arranged for.

PACKING FRUIT FOR EXPORT.

The SECRETARY: I notice a gentleman present who is a prominent member of the Montreal Fruit Growers' Association, who can bring us greetings of that Society, and who is very intelligent on the subject of fruit shipping to Great Britain, and he cannot be here to-morrow. It would be very unfortunate for us to lose the opportunity of hearing from this gentleman. I refer to Mr. R. W. Shepherd, of Como, Que., near Montreal.

Mr. SHEPHERD was received with applause. He said; I am quite taken by surprise. I was kindly invited by your Secretary to attend your meeting; but I came as a listener, and came to learn. We have wonderful respect for your Society. Within the last two years we have formed a Provincial Society—the Fruit Growing and Pomological Society of the Province of Quebec, taking as our guide entirely your Ontario Society, which has been so successful that we try to imitate you in everything. (Hear, hear). I regret that Mr. Brodie of Montreal, and Mr. Dunlop the secretary, were not able to accompany me, the latter having been sent by the Commissioner of Agriculture for Quebec, to investigate the evaporating industry of New York State—which shows how our Province is going ahead. Mr. Woolverton has asked me to say something about packing. Well, that is a very big subject. I regret that I was not able to bring one of my cases that I have been using for fifteen years for exporting apples to England and the other side. It is a very convenient case, holding 196 apples, arranged in four layers, each apple being placed in a pasteboard compartment precisely as eggs are packed in cases. I believe there is a large market in London particularly for the Fameuse—you call it the Snow apple. I have seen what you call Snows about Hamilton; I think it is only a degenerate Fameuse, as far as I can understand; but I have seen as fine Fameuse grown about Owen Sound and Morrisburg, as I ever saw in the Province of Quebec. The best way to export table apples of first quality, is to pack them in boxes—not always in compartment boxes—and there should be no chance of them being bruised. I have tried this year packing them without compartments—packing them in tissue paper in layers, and the interstices packed with paper. The Army and Navy stores reported that they arrived in very good condition. The Fameuse is the apple which the Londoners wish to get. They seem to find it an extremely fine-flavored apple. I have sent at least half a dozen varieties of red apples which are considered good table apples, but they always ask for Fameuse. Now, it seems to me that there is a good future, particularly in the Province of Quebec, for the fruit growers to cultivate Fameuse; and in this section too, along the St. Lawrence, they can grow Fameuse, can't they?

Mr. BOULTER: Yes.

Mr. SHEPHERD: I think high prices can always be obtained for first-class fruit packed in a first-class way. We in Quebec are better situated for shipping Duchess to England than you are in the west, as we can pack our apples to-day and put them on board the ship to-morrow—at least I can do it, as I am only 40 miles from Montreal. The Duchess that I shipped in barrels to Edinburgh, netted me, after paying all expenses, $1.25 to $1.30.

The SECRETARY: Cold storage?

Mr. SHEPHERD: No cold storage. They were out on the ship within 48 hours after they were picked. In Glasgow the Wealthy netted me $1.80, that is deducting all charges except the barrel. In Edinburgh the Wealthy netted me $1.30. I was not as well satisfied with the firm I shipped to in Edinburgh, as I was with the Glasgow firm. I shipped a lot of No. 2 Famense to London in barrels. They averaged $1.10. I could not have got a dollar for them in Montreal. I tried the Montreal market for Duchess, and got a dollar a barrel at auction, less 10 per cent., that is 90 cents. The same apples I shipped to Liverpool netted me $1.25, so that I think we have the advantage. We have a market every year in England for our Duchess. Formerly we used to be able to sell our Duchess in baskets in Montreal and Ottawa and Quebec, but we cannot do it now. The California early fruit has driven that kind of business out of the market as far as Montreal is concerned. It strikes Montreal just about the time that our Duchess come in, and we cannot market the Duchess with profit, so that I certainly shall ship my Duchess every year to the other side.

Mr. BOULTER: Until the California fruit is kept out of Montreal.

Mr. SHEPHERD: Of course that might make some change.

The SECRETARY: Would you do better with a case than a barrel?

Mr. SHEPHERD: I certainly don't advise packing in cases to be sold at auction, as they dispose of fruit on the other side. They allow you nothing for the extra packing

or quality of the fruit. They do not seem to like the apple-case, because in my opinion, there is no chance for waste and all sorts of things to be deducted. (Hear, hear, and laughter). But that is not the business I have gone into. I have tried it to a limited extent, but I do not intend to give the commission men on the other side the opportunity to take advantage of a good thing when they get it. (Hear, hear). The system I follow is to arrange with several firms in London or Liverpool or Glasgow, to take my cases or samples at a fixed price—and that is the only way you can do the case business. Those cases by the hundred cost 40 cents apiece, with the pasteboard interiors. I buy up the right to fill cases in the orchard, and we always calculate 2½ cases to a packed barrelful. The case holds over a bushel and less than a bushel and a half. I have three sizes of squares, three sizes of cases. My largest size square takes a large Wealthy; then the next takes a fair-sized Famense, not the largest size. The second size is the one I like to work with, and when they are turned out of the case every apple is the same size, and they are just the things that Londoners wish for their dinner table. There is no trouble about packing in cases if you can arrange your agents on the other side. I heard Mr. Woolverton or somebody speak about the necessity of having an agency on the other side.

The SECRETARY: That is to be discussed to-morrow; we have been speaking of it.

Mr. SHEPHERD: A firm has been started lately called the Canadian Produce Consignment Company, 18 St. Swithin's Lane, London. I received a letter from them the other day—they had ordered a few cases from me—in which they say: "Your apples are the only ones I have come across on this side that are packed so as to command a full value on the market." He is talking about the first-class market of London amongst the rich people who are willing to pay first-class price for a first-class article. He says further: "I have on many occasions during the time that Sir Charles Tupper was High Commissioner here, drawn his attention to the fact that Canadian produce in most cases fails to obtain a fair market price and ready sales from bad quality of packing. Unless the bulk that is shipped is equal to the early samples of shipments, the ruling price becomes the speculator's bid based on the worst samples." I had not heard of the company until I received this letter, but the gentleman at the head of it is a Canadian, and I fancy if the company is worked on the right basis it is going to be a very good thing for the fruit growers of Canada.

The SECRETARY: You did not tell us whether there was any advantage in shipping in cases, and the prices.

Mr. SHEPHERD: Not to ship to a commission man. I would not advise anybody to do it. This year 7s. 6d. was the highest I got for any case, and shipped in a small way 10 cases. The way I came to ship to these commission men was because I wished to fill up the freight space for which I have a contract with the Allans, and thus secure the special freight rate. 7s. 6d. is not enough to pay for fruit in cases—the expense is too great. About 10s. a case would pay very well; but 7s. 6d. is the highest I got this year from commission men.

Mr. BURREL: Are you satisfied with the case-packing system?

Mr. SHEPHERD: I am satisfied that for delicate fruit like Fameuse it is the only way to put them in first-class condition on the other side. You cannot put them into a barrel. I don't care how carefully you pack that barrel, when you press down the head you must press every apple to a greater or less extent, and when the Fameuse has been bruised it will rot when exposed and in a few weeks they will be all gone; but going in cases they are carried without any bruising. My brother, who resides in Surrey, wrote me last year that in the end of February the Fameuse he had in his boxes were just as good as he ever had in Canada.

The SECRETARY: Kept in ordinary condition?

Mr. SHEPHERD: Just kept in the carriage house outside. Of course there they had no frost; but it shows they keep as long if they are carried in good condition as they would keep here.

Mr. Geo. Fisher: Are the cases dovetailed, or nailed together?

Mr. Shepherd: Just nailed together with wire nails. They hold forty-nine apples in each layer—7 apples each way.

Mr. Fisher: Do you band these boxes with hoop iron?

Mr. Shepherd? We used to employ two and one-half inch wire nails, and drive those nails home through the pine boards, and it is very difficult to open a box that is well nailed up that way,but they will do it in London—and of all places in the world I think London is the worst for dealing with goods. I made a shipment of Wealthys early in September to the Army and Navy stores, but it was three weeks from the time the ship arrived till they got them in the stores, where my contract was to deliver them; and when they were delivered, ten per cent. of them were plundered, and the cases smashed up. Now to overcome that, I have had to put hoop iron about six inches around the corners. It is the corners they pry open, and the pine boards sometimes split.

Mr. Boulter: How thick is this?—planed down to half an inch?

Mr. Shepherd: Yes, the covers are about half an inch. The ends are an inch If you ship to London, make your packages very secure. I have had no complaints from any other port, either about plundering or delay in delivery. I understand that the ships have nothing to do with discharging the cargo in London. The moment they arrive they are taken charge of by the London Dock Co., and they discharge the cargo and deliver the goods.

The Secretary: What do you call No. 2 Fameuse?

Mr. Shepherd: What is not good enough for No. 1. (Laughter). I grade my apples very finely. The first quality I take out and put into boxes; then an eighth of an inch off an apple is an eighth of an inch too small to fit the square, so it goes as a No. 2, which is composed of imperfect fruit and smaller apples.

The Secretary: And yet those paid you for shipping, even this year?

Mr. Shepherd: I netted $1.10 on those. We had no culls in the barrels.

Mr. Caston: It is very surprising and gratifying to me to learn that Mr. Shepherd shipped Duchess in barrels and that they arrived in England in such condition as to net $1.25 per barrel. I see the Fameuse quoted in London as the Snow apple. It is a thoroughly Canadian apple, and orginated, I understand, on the Island of Montreal.

Mr. Shepherd: I think you had better keep to the name "Fameuse;" it takes better in London than "Snow." It is rather a distingué name—the "Fameuse" (the Famous)—and then it shows its origin, There is no doubt the Fameuse orginated from seed brought over from France by the early French settlers. The late Mr. Charles Gibb and myself traced that fact very clearly. There is no apple corresponding exactly with the Fameuse in France. We have a great many other relations to the Fameuse in the Province of Quebec, apples that are very nearly like it, but there is always some difference; a great many of them are sold for Fameuse.

Mr. Huggard: How do you like the Wealthy as a market apple for England?

Mr. Shepherd: In my experience the Wealthy does not take as well as Fameuse. They don't like the quality of the Wealthy—I have had several letters this year to that effect. It sells very well, though, and is a good-looking apple.

Mr. Boulter: The Fameuse tree is very hardy with you down there?

Mr. Shepherd: No, the Fameuse tree is not as hardy as we like. It is what we call a half-hardy tree.

Mr. Boulter: A long-lived tree?

Mr. Shepherd: Yes, but they don't live as long as we would like them to. They have orchards down there fifty or sixty years old.

Mr. BOULTER: There is a tree in our county that my father brought in 1818, that had a good crop this year.

Mr. SHEPHERD: I made a shipment of forty cases to Sir Donald Smith in London on the 14th November. The apples had never been barrelled up, and they were in my own shed. I have my own packers, always packing the apples in the cases. They were not bruised, and were in very good condition, and no doubt carried well. The Fameuse are quite crisp and in good condition now. By packing in cases they cannot be bruised, as each apple is fitted into a square. That is the reason I prefer the squares, and to have the apples wrapped in paper and tightly squeezed. After the case is filled the apples just come even with the top of the case, then we put brown paper right over the top, and then nail the cover on, and they can't move about.

Mr. JONES said he had pressed and shipped Fameuse on the 5th or 6th November, and noticed that they offered no resistance to the apple press in placing the head, and he was afraid that by the time they arrived at their destination they would be bruised clean down to the face, but they went in the finest possible condition. They were shipped from the St. Lawrence District to Ottawa, Buffalo and Toronto.

Mr. WHYTE (Ottawa): I can bear testimony to the excellence of Mr. Jones' packing. I bought a barrel of Snows, and they turned out perfect from top to bottom—the first time I ever bought a barrel and found that result. (Laughter).

Mr. CASTON: This is an exceptional year, and the Snows are now as far ahead as they usually are in January. I attribute that to the hard frost about the 23rd September and the bright weather in August. All apples are about two months ahead of time this year.

OVERPLANTING.

By F. G. H. PATTISON, GRIMSBY.

The time has come in my opinion for us to seriously consider whether we ought not to stop planting most varieties of fruit.

For my part I think that, for the present at all events, in many lines of fruit, production is exceeding the limits of profitable consumption. No doubt it is a difficult thing to limit production, for even when we are agreed that too much fruit is being produced, it is our neighbors whom we think ought to stop; but for ourselves we will go on just a little while longer. Yet if a society were established for the destruction of other people's fruit trees how popular it would be! But although difficult, it is not impossible. It is not too much to say that if every other fruit tree, vine and bush now growing in Ontario were destroyed at once it would be vastly better for us fruit growers, and vastly better for the quality of fruit put upon home and foreign markets. The fruit trees left would receive proper attention which too often they do not get, and the fruit would bring a living price instead of being given away as it was too often this season. When plums are sold by the carload at nine cents a basket, and grapes at from five to eight cents, it is time to call a halt. In this connection I would especially call your attention to the cases of plums and grapes, for while we are undoubtedly over-planted in other fruits too, I think that the pressure is more felt in these two varieties just now. Now we heard it said that this last was an exceptional season for plums, and that the like will not occur again for many years, but I do not for a moment believe it. Possibly the same trees may not bear such a heavy crop for three or four years, but when we consider the vast number of plum trees planted but not yet bearing, we can easily come to the conclusion that this crop—heavy as it undoubtedly was—will not be a circumstance to the crop we will have say in 1898 or 1900. And yet this year many baskets brought the grower nothing, and some less than nothing. Failing some large new outlet for our crop we must be prepared to cease planting or else produce at a loss. Take the case of

grapes. For the number of vines in bearing there was not a heavy crop of grapes this season, yet prices were dreadfully low, the profits very small, in some cases *nil*, when the cost of setting out and labor, etc., of properly attending to a vineyard is taken into account. Undoubtedly of late years the home consumption of grapes has greatly increased, but it seems to me that for the present it has about reached its limit and no fresh outlet is opening up for their disposal; indeed, the French treaty, by injuring our native wine trade, has rather decreased our market, and there seems but little hope of selling our grapes to advantage on the British market, consequently when the new vineyards now planted out come into bearing our prices will be further reduced and profits will be non-existent. Now I must say that I think that this Association is somewhat to blame for the overplanting taking place in this Province, for we have gone into new districts and aroused their enthusiasm for fruit growing which has too often taken the form of wildly planting out orchards without the least enquiry whether there was not sufficient planted already or no. This has happened in many cases, and in that respect I think that this Association has been a distinct injury to fruit growers. Fruit growing enthusiasm is all very well, but unless we fruit growers look forward to being supported in an eleemosynary institution it is bad business. In short, we are cutting our own throats.

Now it may be a fine thing for the public that every available spot of ground in Ontario should be producing fruit, but from the growers' point of view it is not business. Indeed, it reminds one of what the French General said of the Balaclava charge: "*C'est magnifique, mais ce n'est pas la guerre.*"

Another great factor in the matter of overplanting is nurserymen and their agents. Fruit growers have suffered much from nurserymen—in the past from frosted and diseased and over-priced trees, not to mention the mulberry, Russian apricot, prunus Simoni and other frauds, and in the present by being induced by plausible agents to overplant by specious tales of the fabulous profits of fruit growing, which exist entirely in their imagination. These latter remarks apply mainly to farmers and others who have had no previous experience in fruit growing, and I think it is time that this Association should inform such persons that fruit growing is a business of itself, that it is already overdone, and that they had better not undertake to enter a business of which they know nothing, and are only induced to enter upon the plausible representations of agents whose only desire is to sell their trees—and after that the deluge. This Province has a close season for deer and other game and for fish; why not have a close time for fruit planting? *i.e.*, a period of some years during which no fruit trees should be planted, excepting certain of the small fruits, such as strawberries. During that period let the nurserymen turn their attention to the production of flowers, ornamental shrubs, forest trees, and of course mulberries and Russian apricots and trees of like nature. There would then be a chance for consumption to overtake production and for the grower to receive a living profit in the future, otherwise I am afraid that the term fruit grower may become synonymous with that of pauper, and that most of us will end our days in the workhouse. A few of us may survive to afford an example of the truth of Darwin's, or rather Spencer's, doctrine, of the survival of the fittest. But it will be an unpleasant process and we had better avoid it whilst we may.

Mr. ORR: I would like to ask Mr. Pattison if he considers there was a full crop of apples in Ontario this year?

Mr. PATTISON: I consider there was a heavy crop in most parts of Ontario.

Mr. ORR: As far as I understand it, there was not five per cent. of a crop all through central Ontario from Cornwall to Windsor. The whole crop of plums was in the Niagara district and along Lake Huron and Erie shore. Through the greater part of Ontario there was no crop of plums.

Mr. BOULTER: In central Ontario we had no plums at all. If the production in the Niagara district made the price what it was in Ontario, what would it be if we had plums?

The SECRETARY : Then it was not over-production that made them cheap ?

Mr. BOULTER : No, because there is none in central Ontario.

Mr. PATTISON : If Mr. Orr's contention is true, I think it would only strengthen my case instead of weakening it.

Mr. ORR : That is what I wanted to confirm. If there was not over five per cent. production in the Province from the Quebec line to London, and if those points can produce a glut like that, what would it be if there was a heavy crop over the whole country ?

Mr. FISHER : I understand that a great many of the plums were of exceedingly poor quality because of the excessive crop, and that many of them were not marketable.

Mr. ORR : For my own part we never had a better crop or finer plums.

The SECRETARY : It was not Canadian plums that blocked our market this year, but foreign fruits of other kinds.

Mr. RACE : The question might very reasonably be asked, is there an over-production of apples in Ontario ? Is there a glut ? From my own experience I can say that apples sent from here to Portage la Prairie cost laid down there $2.70 to $3 a barrel. It seems to me if we had reasonable freight rates to Manitoba and the great North West there should be no fear of producing too many apples in Ontario. There is not one settler in Manitoba out of twenty that can afford the luxury of apples at such a price as they now cost. The whole secret of the difficulty is the getting of the apples at a reasonable figure into the markets in the sections where they are wanted and will be consumed. Great masses of the settlers west want our apples. Many of them have not tasted an apple this year. I have had letters to that effect, and we have tried our best to send apples to our friends there but they cannot afford to pay the high prices of apples when they get there.

Mr. ORR : I do not believe there are too many apple trees planted in the country. If I were planting to-day I would very much rather plant apples than plums. I believe we have more plums planted in the country than we can possibly find market for when they all come into bearing.

Mr. PATTISON : I certainly agree with Mr. Orr that if there is any fruit we can plant largely it should be apples, because there is a large outlet for them. My paper was not intended to include apples, although in some districts some varieties of apples may be over-planted ; but for those other fruits we have not an outlet, and for the present there seems no prospect of getting one.

Mr. MORRIS : Some shipments of early plums were made to Montreal from our neighborhood, and the word came back that there had been several cars of California plums that were shipped to Boston, sold by auction there, not wanted there, re-shipped to Montreal and thrown on the market, thus causing the low price for Canadian plums. These California plums are put up in very nice fancy boxes, but the quality is very inferior. The appearance takes with the people, and from reports received I believe that the cities of Canada have been glutted with the California plums, which have killed our market.

Mr. DALY : Why not ship our plums as well as our apples to the North West where they cannot produce them ?

Mr. BOULTER : Very fine plums are being raised in the Okanagon Valley and a large portion of the plums in Winnipeg are British Columbia plums, and they work eastward, and we cannot successfully compete with them. I do not think we would find an outlet in Manitoba for plums on account of the enormous number of trees that have been set out and the quantities that are shipped from Vancouver east to Winnipeg.

Mr. FISHER : What are they doing in apples out there in British Columbia ?

Mr. BOULTER : Well, I had a chance to verify a little what I stated last year. I was with an excursion of a thousand people at Agassiz and I saw some very nice fruit

and had the pleasure of meeting the Horticultural Society of British Columbia, and fine samples of the summer fruit were brought forward; but it bears out exactly what I say, and I will stake my reputation as a man that they will never grow a good winter apple in British Columbia outside of the Valley. The trees I saw at Agassiz are nearly all summer trees. There are points where you could grow probably a good winter apple; but I wish I could have brought home the report of the Horticultural Association of Vancouver Island, saying that after twenty years of honest, earnest endeavor to grow a good winter apple they failed. The climate around there is too moist to grow them successfully. The summer fruit was very nice. The trees on the farm look very odd. They are all grown very close to the ground—not pruned up to get the sun and air to color them. I have yet to learn where they can grow a good winter apple in British Columbia; but no finer plums and cherries can be grown on the continent of America, and strawberries and good summer and early fall apples can be grown in British Columbia. In Okanagon Valley, where Lord Aberdeen has spent so much money, he may succeed in growing hardy winter apples, but outside of that I doubt if they can be grown.

Mr. BURRELL: You don't consider the flavor of the British Columbia plums as good as Ontario?

Mr. BOULTER: They are large and more like the California.

Mr. BURRELL: All the pears and plums tend to elongation in British Columbia?

Mr. BOULTER: Yes.

Mr. BURRELL: The flavor of the fruit from Agassiz at the Toronto Exhibition was much inferior to the Ontario fruit.

A DELEGATE asked if it was likely if we would have a good crop all over Ontario in one year.

The SECRETARY: I have sent over 1,500 barrels to the old country this year and am receiving returns every fortnight or so, and the price has averaged from $1 to $1.25 and in some cases $1.50 per barrel; and I don't think we ought to be altogether discouraged and give up the business and dig out our orchards from the present full year of apple growing. It is not a very great income we get from the apple orchard at those prices, but I think we can live and produce even at those prices.

Mr. A. M. SMITH: What other farm crop, even allowing the low prices of the fruit, has paid any better than the fruit crop?

Mr. HAYCOCK: I think we can account for the over-production of plums, etc., in another way than has been advanced so far. We will have to go back a year in order to get the real cause of the over-production and the low prices of plums this year. A year ago last May there was a general frost throughout the district, and fruits of all kinds were almost totally destroyed in the western part of Canada; consequently there was no fruit last year; and this year there was not only an over-crop of plums but of every other kind of fruit—strawberries and raspberries, wild and tame, and currants and gooseberries and every kind of fruit. They, coming into competition with the plums, brought a glut in the fruit—not in plums alone, but in the same class of goods, in fruits, and the consequence was that plums and grapes, coming in rather late, the good housewives through this country had their gem jars all filled, consequently there were lower prices than you need look for again. It is hardly likely that there will be another year when there will be such a general good crop of all kinds of fruit as there has been through Ontario this year. I think that is one reason why the later fruits this year got such extremely low prices. Then the prospects of a good crop of apples prevented people from laying in a larger store of canned goods for winter.

Mr. GROFF (Simcoe): A representative of a large fruit firm in Detroit told me that during the plum season they had to keep two men busy all the time breaking the California packages and transferring them to domestic packages in order to sell them, on account of the unpopularity of California fruit. In regard to the general question, it is

just the same with the cattle market and the horse market, and these things cure themselves. You cannot order any man to stop planting or even suggest it. Individuals must be the best judge. Quality will always rule.

Prof. SHORT, of Queen's: Are farmers finding it more profitable to grow any other crops than fruit? It is quite obvious that they will go into fruit until the profits on fruit come down, and as long as the price of grain and other produce continues low the price of fruit cannot be high, unless you adopt Mr. Pattison's plan of restricting the planting. But there is another point of view—that of the consumer. (Laughter.) I wish there could have been put before this Association a fair sample of the kind of fruit that was put on the Kingston market this summer. As a regular visitor to the markets I must confess that I was lamentably deceived on quite a number of occasions this summer in purchasing what I took to be, from the aspect of it, a very fair basket of fruit, and when I arrived at home about half of it had to be thrown out, and as an individual in such cases I was discouraged from buying another basket of fruit; although if I had been successful in getting good ones I should have bought probably twice as much on account of the importance which I attach to the devouring of fruit. It seems to me that the Ontario people might take a leaf out of the California book and put up their fruit in some better order and in a shape that would guarantee that the bottom of the basket or package would be fairly in keeping with the surface of it, and the fruit would not be in such a dilapidated condition when it reaches places like Kingston, which has to depend largely on outside areas.

A DELEGATE: To what particular fruit do you refer?

Prof. SHORT: I refer to plums, peaches and grapes in particular.

Mr. JOHN STEWART, of Benmiller: I think the cause of the low prices in fruit put up for market is that it is not properly matured. I saw thousands of baskets of plums shipped from my section to London and Toronto that were not ripe and fit to handle; and I saw them sold in London for twenty-five cents a basket. I had some sold in the same market for sixty and seventy cents a basket. I think there is a great deal to be done wish proper selection in shipping. In regard to over-production this season, I have shipped several car-loads of apples to the old country and my prices have been fair, netting from $1 to $1.30 per barrel. I know parties that shipped at the same time to the same market and got $1.14 a barrel for the King; I realized $1 a barrel for the King. If the fruit is not put up well and in an attractive manner it will not sell well in any market. One trouble in shipping apples in barrels is that the fruit is over-pressed and heated up too high. There is no need for fruit in a barrel to be bruised any more than in a box.

Mr. WHYTE: Hardly five per cent. of the peaches landed in the Ottawa market were fit to eat; they were as hard as bullets. (Laughter). If the fruit had been put on the market in a fit state to use, I think a large quantity of peaches would have been eaten raw. I bought baskets of grapes this year that were perfectly unfit for human food. They were dirty and broken and bruised, and bunches only half filled, and never should have been sold at all. That is the condition of things that brings down the prices of fruit. When you are buying a basket of grapes you cannot tell whether they are good fruit or only fit to throw out. I think there would be a large market for western plums to be eaten raw if they could be put down in a good condition. The California plums you get soft and in a good condition to eat; but they are undoubtedly inferior to the Ontario plums.

Mr. FISHER: If you do not want this green fruit do not buy it. The reason we prefer to ship fruit green is that it then realizes more money than matured fruit.

Mr. WHYTE: This is not early fruit; all through the season we bought peaches that were unfit to eat.

Mr. BOULTER: Don't you get the names of the packers on the packages?

Mr. WHYTE: No, they don't do that.

Rev. PRINCIPAL GRANT: I think where we have been making a mistake the last half hour is forgetting that evidently Mr. Pattison is a humorist, and he intended that

paper of his as a joke, and we have been so dull that we have not found out his meaning. It has dawned on me for some time back that we might have seen it at the outset; for here is he a member of this Association, and yet his intimation is that the proper place for us is the penitentiary! (Laughter). Now it is quite clear that what he intended us to undestand was that there is a field for this Association, and that is to point out that you cannot produce too much of good fruit. (Hear, hear). This is the whole point. Mr. Shepherd indicated it very clearly in his experience with the Fameuse apple. He could get splendid prices for them if only the right steps are taken to bring the apple from the orchard to the tables of the consumers;—and it is a blessing that a word or two has been said on behalf of the poor consumer. I happen to be only a consumer, and I say I would have eaten a great deal more fruit this year even than I did, only that my experience was the same as Prof. Short's. The fact is it is almost the same with fruit as it is with eggs—if you once get a bad egg you don't eat another for a month. (Laughter). So you buy one basket of peaches or a barrel of apples, and you find the top ones good and all below very bad, and you get so disgusted that you fall back on your common chop and resolve to go without fruit. We could eat a great deal more fruit than we do if the fruit was only of the best quality and brought to the consumer, especially in the great markets, in such a way that he takes delight in it. Now what is needed is that steps should be taken along these lines. For instance, I have heard of one man in this Province who shipped 40,000 barrels of apples this year, and yet he did not make as much as Mr. Shepherd made out of one box—less in fact. (Laughter). And why? Chiefly because of the awful sinners in Montreal. (Laughter). There are not sufficient facilities there. For instance, on one occasion it was arranged that a great quantity should go by steamer, and they were sent in time, but there was some block or delay at the railway station, and as there was not another steamer, for some time, they were spoilt and had to be dumped into the harbor. Then again we have not got agencies in London that we should have, and that Mr. Shepherd referred to, or we have not taken the trouble to get into direct communication with stores such as the Army and Navy stores in London, and instead of that we allow the commission merchants to get the immense profits that we do. I think it is quite clear that the paper that was read was not meant at all to say that there are too many fruit trees or too much production. We have heard that cry all along the line. We are told that there are too many potatoes produced—(laughter)—that there is too much wheat produced, and we don't get a living price for wheat. And then manufacturers tell us that there is too much production of cotton and woollens, although all the time people only half-clad and half-fed. (Laughter). And yet we are hearing the cry of over-production! This is all nonsense —there is nothing like over-production in any one of these things. I, as a consumer, so think because I want to get them reasonably cheap so as to get enough of them; and you can only manage that, not by limiting the quantity of fruit produced, but by having the very best kinds, and that is what this Association is for, to show what is the best kind, what is the best way to get it into market in Canada and abroad; and I wish that there was ten times as much fruit produced in Canada as there is, for I believe that this is one of the very best countries in the world for apple production. I have eaten apples in almost every country in the world, and I do not know any country in the world where the apple is so good as it is in Canada. (Hear, hear and applause). And if arrangements are only made to get fruit in right shape to the best markets, and if we only raise the best kinds, there is almost no limit to the development that there can be all over Canada. You get peculiar kinds in different provinces. What Mr. Boulter says is true about British Columbia not producing certain kinds of apples; still they produce some kinds very well. The Northwest Provinces do not, but in Nova Scotia you can get Gravensteins the like of which I have eaten in no other country in the world. Then the Fameuse is the original habitant of Quebec because it was brought from France by the Sulpicians. But the great work of this Association is to go on doubling and quadrupling the production of good apples and seeing that these are got to the tables of the poor consumer. (Applause).

ADDRESS OF WELCOME.

Mr. Thomas Briggs, President Kingston Horticultural Society, read an address of welcome as follows :

To the President and Members of the Fruit Growers' Association of Canada :

Gentlemen,—On behalf of the District Society of the City of Kingston, I have the pleasure of congratulating and welcoming you on the occasion of this your annual meeting for the purpose of discussing and promoting the objects of the Association in all matters connected with the progress of horticulture and floriculture, in both of which great improvements have been made during the past few years, the result, no doubt, of the information obtained at your annual meetings by the discussion and explanation of the various experiments and different modes of cultivation.

The climate and soil of Canada are very suitable for growing most kinds of fruit, and every effort should be made to improve in quality and quantity, as fruit is becoming a leading article of export. Many thousands of barrels of apples have already this season been forwarded to England, where the Canadian apples rank foremost in market, and are readily disposed of at remunerative prices.

Referring to the floral department, the improvement in producing flowers in their varied classes is remarkable, as may be observed in some of the old leading kinds, such as the rose, gladiolus, chrysanthemums, dahlia, fuchsia, petunia, pansy and many other kinds too numerous to mention. This improvement is the result of skilful hybridizing and improved modes of culture, by which the plants are increased in size and form, and in colors and shades. It may well be said that the florist is perfect master in this department, and competent to produce flowers of almost any desired shade.

Yet, notwithstanding all the advances so obtained, it is expected, through the skill, science and perseverance of the members and cultivation, that further improvements will follow.

As electricity possesses light, heat and power and is now made available in nearly every branch of industry, it might possibly prove an assistant in advancing horticulture and floriculture, which you are endeavoring to bring to perfection.

I will not further intrude upon your time by referring to the subjects of your meeting, but will leave the numerous points for their proper place, to be discussed by those who have met here for that purpose. We hope that great benefits will result from your discussions and that your meetings will prove a success.

His Worship Mayor Elliott then welcomed the convention. He alluded to the early history of the place, and referred to its many present advantages.

The President : On behalf of the Fruit Growers' Association of Ontario I assure you we appreciate very highly all the words of welcome that you have extended to us, also the kind invitations. It was with feelings of very great pleasure that our officers decided to accept your kind invitation to hold our annual meeting in the old historic city of Kingston, founded on a rock, emblematic of the firm and lasting loyalty of her people, and we feel that not only every fruit grower but every Canadian is under a debt of gratitude to your city for the many eminent men that she has produced—men who have had so much to do with the founding and up-building of this grand Dominion of ours. (Applause). We hope that your citizens will attend our sessions, feel free to take part in the discussions, and ask questions. We have men in our Society who are full of knowledge on these lines—(hear, hear)—who have grown gray in experimenting in different fruits and flowers, and who will gladly impart any information they can. We in turn expect to receive a great deal of valuable information from you, coming down here among the wise men of the east. (Laughter). Meeting in this building is suggestive that while we may give you some valuable ideas as to how to produce the berries, you in turn can teach us how to produce the cream. (Laughter and applause). The next item on the program is the President's address. It is an old time-honored custom, and I will have to confine myself to my manuscript. (See page 4.)

NEW HYBRID CANNAS IN 1896.

By Mr. H. H. Groff, Simcoe.

All that was promised and hoped for by the originators of these most popular of all decorative plants has been fulfilled and more. Only those who have followed the rapid advance in quality and beauty of these grand results can fully appreciate the work of the past five short years; for in that time no other plant has been equally glorified by the hybridizers' skill. To-day we stand upon the threshold of a still greater and grander future, in the results of the first distinct outcross between the perfected hybrid of standard type and species bearing flowers of Iris form. The product of this cross in Italia, Austria and Burbank give us the forerunners of a type destined to claim a first place for size and beauty of form and coloring in the flower, with increased vigor and productiveness in the plant.

As a decorative bedder, aside from the beauty and brilliancy of its flowers, the Canna has no equal for tropical effect in this climate. Planted in clumps, or as centres in bordered decoration, the banana-like foliage in varying shades of green is most attractive; while in the dark foliage varieties, the reds, bronzes and deep plum colors, bear striking contrast to surrounding growth. Planted in solid beds, the system adopted at the World's Fair, the leaves feather beautifully to the border or lawn, leaving no stalk exposed to view.

The greatest advance, however, is in the flower; from the narrow petal and meagre spike of a few years ago, we have flowers to day from six to seven inches in diameter, with petals from one and a half to two inches broad, in the old types.

To many original colors of unrivalled brilliancy we have added numberless shades and combinations of red and yellow, from the deepest garnet to the most delicate ecru. Of course many of the newer tinted varieties are not as free flowering as the older yellows and reds, but we must not forget that color and quality of bloom fairly entitle later hybrids to recognition.

If permitted to refer to my experience during the season just past, I would say, that after discarding some one hundred named varieties, my collection of these covered about sixty-five of special merit, with the addition of an equal number in distinct and beautiful seedlings of my own originating. In the former nothing that was worth buying was omitted, the cream of all choice American collections were fairly tested, and treated on their individual merits only. From these selections I secured, by hand fertilization, several thousand seed that cannot be duplicated commercially; many of these are already growing finely, and are ready for four-inch pots. Having effected similar crosses to Italia, Austria and Burbank, it is my expectation that these forms will be duplicated in many new colors, and in dark as well as green foliage varieties.

Let me say in conclusion, that my seedlings of 1896 were the source of great pleasure and satisfaction. From thousands of spikes only a small percentage were not worth perpetuation. Many produced, in addition to numberless variations in shades of standard excellence, new forms and types; some distinct forms peculiar to green foliage varieties were transferred to those with dark. Among the most unique forms were several cases of abnormal development of the inferior petal, it greatly exceeding in size those usually classed as superior, this novel variation from the original, adding much to the orchid like appearance of the flower.

In view of these experiences it is not unreasonable to hope, and even to expect, as has been beautifully and fitly expressed by Luther Burbank:—"That having taken a few steps into the measureless fields of scientific horticulture, these will stretch out as we advance into the golden sunshine of a more complete knowledge of the forces which are to unfold all graceful forms of garden beauty, and wealth of fruit and flowers."

THE GLADIOLUS IN 1896.

By Mr. H. H. Groff, Simcoe.

When we consider that previous to 1896 the Gladiolus of commerce contained the blood of only two species, or at the most, three; the further infusion of that from a fourth, may not seem to be a very rapid advance in the line of perfection. But as is the case with most hybrids, time is necessary to assure the value and fixity of a cross, in view of the natural tendency to degeneration and reversion. As claimed by me at Woodstock last year, the past five years have seen greater progress in the development of the Gladiolus than the whole preceding period of its history.

The season just closed was, in my section of the country, unequalled in memory. From early spring to the first killing frost, continuous moderate rain and showers kept the landscape fresh in June verdure without intermission. At planting time I could say that no distinct variety of Gladiolus, obtainable by favor, friendship, or sterner business methods was unsecured. All that care, science, and a favorable season could do was in their favor, and the result showed that it was appreciated. In view of this experience I can only say that past expressions on the various sections remain confirmed.

Let me note in passing, however, that greater care is used in selection from the Gandavensis section; which when given, is the most useful as known to the amateur.

The Nanceianus section excels all hybrids of Saundersonii in the regal beauty and coloring of its enormous flowers.

Had less been promised for Childsi, we might not have expected the great claims for improvement to be fulfilled. Of all sections it lacks more points necessary to reasonable perfection than any other.

The later hybrids of the Lemoine, or Large Spotted section, make it to day the most beautiful of all, no other excelling it in rich and varied coloring, and even in size comparison is favorable.

The first steps after bringing a hybrid to a reasonable degree of perfection in form, is to increase its beauty of coloring. This is only fair to the amateur buyer, who cannot yet be charged with undue impatience; and I would like to say here that this must be more than on paper. In fact I have come to the conclusion that descriptions on paper fail to convey to the mind's eye a counterpart of the form and coloring appearing later under cultivation. So firmly have I become convinced of this, that my selections for testing are often made without reading the detail of description; varieties being increased only on merits proven in my trial grounds. It is here that the system of tested selections introduced by me, stands between the amateur and disappointment. Without detailing the several sections I claim that the advance in quality is limited to too few of the high priced varieties introduced; in fact the system of "collections" in high priced novelties invariably brings disappointment, in the small percentage of actual value secured.

Having prepared for the past season's crossing such a collection of perfected hybrids, and new species, two months continuous effort of over ten hours daily produced four pounds of seed. This from an expensive stock, the cost of an assistant, and my own time, must compete with that sold at $4 per pound. I simply mention this for the benefit of those who often ask for it in bulk. In my correspondence I am in touch with the growers of the world, and there is no place where it is possible to duplica te it, no matter how much one might be willing to pay In proof of its value all seedlings are withdrawn from my list excepting those of 1896, and these represent a material advance in quality over those previously offered. The largest flowers with me during the past season were from my own hybrids.

A year ago, in addition to the latest work of foreign specialists, I purchased the whole of Mr. Burbank's stock of California Hybrids the product of some fifteen years' selection and hybridizing. Suitable out-crosses with these and the choicest foreign novelties, gave me a quantity of seed the value of which is difficult to estimate.

Last month I was fortunate in securing the whole surplus (half a ton) of the collection of Dr. Van Fleet, of New Jersey, America's most noted scientific hybridizer of the Gladiolus; made up of the cream of one thousand named selections from the growers of the world, culled by him to the extent of fully two-thirds. In addition to the species

secured, many of which are little known and found only in botanical collections, I also got many new hybrids of Adlami, Aurantiacus, Cooperi, Cruentus, Milleri, Papilio albus, Platyphyllus, Leitchlinii, Trimaculatus and others; he retaining only some undeveloped seedlings for future amateur work, and in these I hope to participate later on. Dr. Van Fleet is resuming the practice of his profession. Referring to the first paragraph in this paper, which states that the number of species used in all the Gladioli of commerce is only four, the addition of crosses from the above new species must open a field of limitless variation.

Prof. SAUNDERS: I would like to ask Mr. Groff the names of two or three varieties which he referred to as having the lower petal very much enlarged, making it superior in size.

Mr. GROFF, Simcoe: Those are my own in name, seedlings of my own originating. Canadian hybrids you may call them.

Mr. HUGGARD: Do you find any difference between the light shades and the dark shades of the plants? Which is the most vigorous? I refer to the cannas.

Mr. GROFF: I find no difference in the vigor of the plant. The dark foliage varieties are equally vigorous with green, but they are not quite as free flowering. That is the only difference, but that is being overcome by crosses with the green varieties, the usual method for endeavoring to produce durable plants.

Mr. HUTT: I am sure many would like to hear from Mr. Groff a short account of his method of raising gladiolus.

Mr. GROFF: I suppose there is no place the size of mine in the country that has a greater diversity of soil. I have not more than two acres. On it I have sandy loam, a good heavy loam, solid clay and vegetable deposit. My habit is to grow them for one season on one block, another season on another, and so on, keeping them changed about, although when I cannot do this conveniently I usually fertilize them with hard-wood ashes, being the most convenient form of potash, and in the blooming season it is desirable to use a little bone meal. I usually plant them about four inches deep, which is the most convenient depth for the average soil, and water them during the season when it is dry. I think that having a supply of water means either success or failure. If you have not water at certain times they will not produce as good results as they would with an ample supply of water.

Mr. HUTT: How often do you flower your bulbs:

Mr. GROFF: You touch the question of degeneration, and in the Gandavensis section there are some varieties that won't bloom for more than two or three seasons, but there are some varieties that will bloom season after season. Even in the Gandavensis section there are varieties that will not produce bulblets at all, but only produce by division, and those go on and bloom year after year. I have some Gandavensis that produce no pollen, but sometimes bulblets; I received them from a specialist in Des Moines, Iowa. With him they would neither produce seed nor bulblets. The greatest difficulty in that way is in the Gandavensis section, but discarding those varieties that do fail you could get very fair results year after year, but occasionally you have to let them go without one season's blooming. As to hybrids, it is difficult to answer your question in a short time, newer hybrids, of course, possessing more variety from later crosses with species than the old in-bred Gandavensis.

Prof. SAUNDERS: I have been much impressed this last season with the importance of a plentiful supply of water for Cannas, and might perhaps take the liberty of giving you the result of an experiment that has been tried at Ottawa with sub-irrigation to demonstrate this. We are not always favored with just such suitable soil as Mr. Groff has, that will hold a large amount of moisture, and in our flower-beds at Ottawa we have rather a dry, gravelly sub-soil. In order to overcome this lack of moisture natural in the beds, one of our Canna beds was sub-irrigated by laying ordinary field drain tiles in one course all around the bed about 18 inches from the margin and laid perfectly level, so that water running into any one of these tiles would find its way evenly throughout the whole series. At one point there was an upright tile connecting with this lower series, and the hose was

turned into this upright tile once a week and allowed to run for several hours, the tiles being laid from 8 to 10 inches below the surface. The result was that the water found its way out at every joint, and by capillary attraction it came upwards, and after two or three hours you could see a little moisture on the surface of the bed, and the whole substratum was so thoroughly moistened that the Cannas had all the water they wanted. The result was that when this bed was compared with another bed on similar soil without this treatment the growth was considerably more than double, the plants very much more vigorous, and the flowers very much finer, and they came into flower considerably earlier as well, showing that that is just what Cannas require—a plentiful supply of water. I do not mean to say they would grow in a swamp, but they want under-drainage, but at the same time have the soil supplied with sufficient moisture so that the roots may be kept in a very active condition and the growth thus proceed very rapidly. In regard to fertilizers, we have not had very much success with bone meal. There are different qualities of that, and some of it may contain more animal matter than others; but we have had a great deal of success in using a pound of nitrate of soda to a fifty gallon barrel of water, and using this occasionally for watering the surface, or otherwise sprinkling the nitrate of soda in fine powder over the beds occasionally before rain. We have in this way succeeded in increasing the size of the flowers quite perceptibly, and promoting the vigor and growth of the plants.

Mr. GROFF: My reference to bone meal was for Gladioli intended for seed raising, not Cannas. The Canna only requires three things and it will be successful anywhere—plenty of food, moisture and heat; if it has plenty of rich food, ample moisture during warm weather particularly, and as much heat as possible, good exposure to the sun, it is bound to succeed.

Mr. BURRELL: Don't you employ nitrogen in any form to your Gladioli?

Mr. GROFF: No.

Mr. WHYTE: Is there any difficulty in keeping over Gladioli for a second season?

Mr. GROFF: I usually wrap mine up in paper, and if the quantity be small I sometimes cover that with wax paper. My bulblets, when the quantity is not so great that I can put them in boxes by themselves, I also wrap carefully in ordinary paper and cover that with heavy wax paper to prevent drying out. That is the only difficulty—to prevent the bulb from drying out during the winter. Then they should be kept in a cool, dry place.

Prof. SAUNDERS: What do you think of the Flamingo canna? That has given us a larger lower petal than most of the cannas. How does it compare with the other varieties?

Mr. GROFF: My experience with the Flamingo was similar to that of many growers in the United States. It did not do very well with me, although in some localities I believe that it has. I consider F. R. Pearson a much better dark flower than Flamingo, and taking all points into consideration Alphonas Bohier is better than Flamingo, although not nearly so expensive. It has a much higher growth and slower growth than either of those I have spoken of, but the deeper colored one would be F. R. Pearson.

CHRYSANTHEMUMS.

Mr. H. L. HUTT, who was to have given a paper on this subject, explained that when Secretary Woolverton visited the Agricultural College this summer and saw about 120 varieties of crysanthemums growing in the conservatories at the College, he asked the speaker for a paper for this meeting, but the latter had not been able, on account of pressure of work, to give any time to that subject, but he hoped another year to be able to give something worthy of the subject. He had been taking photographs of some of the best varieties, and these were passed around the meeting.

THE SWEET PEA.

By R. B. Whyte, Ottawa.

Any observant gardener who has studied the catalogues for the last five or six years will have noticed the great increase in the varieties of sweet peas offered for sale. Dealers who listed ten or twelve kinds in 1890 now catalogue seventy or eighty varieties, and every year is adding to the number. No less than twenty new kinds were offered for sale this year for the first time. There is now considerably over one hundred named varieties on the market, and Mr. Eckford—who has originated the majority of the best new kinds—has promised several more next season, which are said to be finer than any heretofore offered.

Up to two years ago all varieties were of one type in form and habit of growth, a tall, growing vine, climbing by means of tendrils over anything that came in its way in its efforts to get as near the sun as possible, bearing flowers with a broad, rounded petal at the back called the Standard, two smaller petals called wings, which bend over as if to protect the central portion, formed by two petals joined together, called the Keel, inside of which are the essential organs of the flower, the stamins and pistil. The first departure from this type was in the so-called double sweet peas, in which the single standard is multiplied two or three times. These have not proved satisfactory, a very small percentage of the seeds produced double flowers, and there is no increase in the attractiveness of the blossom. A great beauty in the sweet pea is the straight, smooth standard which sets off so well the barred colors of the wings and keel. Any improvement must come, not from multiplying the parts—it is now perfect in shape—but from new combinations of color, more flowers on stalk, and more substance in the petals.

Another departure from the type of growth is the much advertized dwarf "Cupid," which has signally failed to justify the claims made for it. It is undeniably a dwarf, forming a mat of 12 to 18 inches diameter on the surface of the ground, and is interesting on that account, but in every other respect it is a disappointment. Four-fifths of the seeds sown in this locality were unfertile. The flowers are small and the stalks short, and in every way it is inferior to Emily Henderson or Blanche Burpee.

The causes of the great popularity of the sweet pea are not hard to seek. No other flower combines so many points of excellence. In beauty of form, beauty and variety of coloring, exquisite perfume, convenience for cutting, and durability after cutting—for they can easily be kept fresh for a week—it is unequaled, and if properly cared for the quantity that can be taken from even a small row is enormous.

A correspondent of "Garden and Forest" kept a record of the stalks pulled from a row 60 feet long, from June 11th to October 20th, when the last one was picked. The total was nearly fifty thousand beside a large number that were allowed to go to seed. From no other flower could we get the same profusion of color and fragrance.

The best soil for growing sweet peas is a good, heavy clay loam, rich and capable of retaining moisture, as it is only by keeping the roots cool and moist that we can succeed in having them in bloom the whole season. If the soil is not very rich put on a good allowance of well decomposed stable manure the previous fall, dig it deeply in and mix thoroughly with the soil, as they do not take kindly to manure in contact with the roots. If not applied till the spring bury it deeply, several inches below the seed bed. If you want to feed them extra well a dressing in the spring of a fertilizer rich in potash—or wood ashes—makes stronger and more vigorous plants.

Plant as early in the spring as the ground can be worked. They are quite hardy and will stand several degrees of frost without injury; indeed, in dry ground where water does not lie, they may be planted in the fall with perfect safety. Make a trench three inches deep, drop the seeds two inches apart, cover one inch deep at first and do not fill in the other two inches till the plants are well up above the ground. If all the seeds grow pull out every second one—or transplant to another place, if wanted, after all danger from cutworms is over—as four inches apart is close enough or the best results.

If your soil is light and sandy, it will be necessary to plant much deeper. Make the trench six inches deep and fill in a little at a time as the plants grow, taking care not to cover them with the earth.

The soil must never be allowed to become dry ; the frequent use of a sharp rake keeps the surface open and prevents excessive evaporation, but in addition water must be supplied liberally after the middle of June, unless in unusually wet seasons. Do not waste the soap-suds on wash day ; it makes one of the very best fertilizers.

Some of the new varieties grow so tall—in good soil as high as six to eight feet—that it is necessary to provide support for them not less than six feet high. The most convenient trellis material is poultry netting with a two inch mesh, fastened to stout posts, firmly set in the ground, with a top rail to keep the posts rigid so that the netting can be stretched smooth.

A very handy trellis can be made from seven or eight feet of netting, bent in the form of a cylinder and the ends twisted together, with a stout wire hoop at each end to keep it in shape. This, set on end, fastened to a stake to keep it upright, and the peas planted around the outside, makes a very pretty object in the garden, when covered with flowers of one or two varieties. A great advantage of this style of trellis is that it can be set up anywhere on a few square feet of ground, and can be shifted from place to place as wanted each season. If one is willing to take the trouble to tie the vines to wires an ordinary grape vine trellis does very well with the wires about eight inches apart.

The insect enemies of the sweet pea are few in number. Cutworms are sometimes troublesome. When numerous they may easily be poisoned by placing little bundles of any succulent weed dipped in Paris green and water and laid every two or three feet along the rows, or they may be dug out in the usual way.

A more serious evil to contend against is the blight, this is only troublesome in very light soils, or where peas have been grown several years in succession in the same place. It first appears when the plants are about a foot high, the leaves first turn yellow, then brown, and in bad cases the whole plant becomes black and dies. There is not much known about the cause or nature of the disease, or how to cure it when it appears. Probably spraying with Bordeaux mixture is as good a remedy as is available.

A great deal of what is taken for blight is really caused by that pest of the greenhouse and window garden—Red Spider. It is so insignificant in size that it is seldom observed unless looked for, even then it takes good eyesight to locate him, though the results of his presence are evident enough. Fortunately it is very easily kept in check, a vigorous spraying now and then from the waterworks hose if available, or from a spray pump is all that is necessary.

In describing varieties, shapes and colours run into one another so much that it is somewhat difficult to classify them, The colours white, red, yellow and blue are so inextricably mixed and blended that any classification founded on colour is unsatisfactory. In shape there are three fairly well marked divisions ; the first, from which all the newer varieties are derived has the standard somewhat wedgeshaped and bent back from the rest of the flower or reflexed as in "Painted Lady," the second, of which "Blanch Burpee" is a good representative has the standard straight and erect with the wings and keel close up to it ; in the third form, as in "Lottie Eckford," the standard is inclined forward at the edge as if to envelope the wings, this is known as the hooded form. Many of the most admired new sorts belong to this class. In some cases this tendency of the standard to curve forward is carried so far as to cause a roll at each side as in Oddity, when this bending forward is carried to such an extent it may be interesting to the specialist from its oddity, but it certainly could not be called beautiful.

Whether you plant named varieties or mixed be sure to plant enough ; you will be surprised at the number that can be used as cut flowers, not only in your own household but by your friends. I have yet to see the visitor to my garden that was not delighted to get a boquet of sweet peas. Give them away freely. If you want to have an abundance of flowers all summer they must be picked frequently, never allow them to go to

seed. If you plant them mixed get the best Eckford mixtures, but it is much more satisfactory to buy named varieties, as you can then select such colors as you prefer. Most of the mixtures have too large a proportion of dark colours, for the best effect, in my opinion, not less than four fifth of a collection should be of light or medium shades.

In making a selection from the many varieties offered for sale a great deal will depend on the individual taste of the grower, what colours one prefers and also on the amount of space that is available ; to grow anything of a larger collection requires a long stretch of trellis. A weak growing kind is apt to be overgrown by a stronger neighbour unless there is about five feet allowed to each kind.

Probably a collection of twelve sorts would satisfy the average grower for variety. In that number a very fair representation of the different shapes and colours can be had. Leaving out of consideration the six new kinds sent out this year by Mr. Eckford, as very few growers would care to pay the price asked for them, 2s. 6d. the package, I would recommend, as the best out of seventy varieties grown by me this season, the following twelve :

1st, " Blanche Burpee," decidedly the best white to date, of the largest size, fine form, good substance and a profuse bloomer.

2nd, " Primrose," pale primrose yellow, a very delicate and handsome flower, by some " Mr. Eckford" is considered a better yellow, but it has not done so well with me.

3rd, "Ramona," a new Californian variety sent out this year, of largest size, slightly hooded form, colour white, with faint rose pink lines on the standard, a lovely flower, strong, vigorous grower and profuse bloomer,

4th, "America," also a new one from California, the best red and white stripe, white ground with brilliant blood-red stripes. A most effective flower, either in a boquet or on the trellis.

5th, "Princess Beatrice," pale blush and pink. An old favorite, much grown by florists for cut flowers.

6th, "Lottie Eckford," white suffused with lavender, standard and wings with a delicate blue edge, a most exquisite flower.

7th, "Countess of Radnor," standard a clear lavender, wings a little darker, good size, hooded form, the best of the lavenders.

8th, "Katerine Tracy," new last season, by far the best pink to date, of largest size, good shape. Clear rich pink all over, the most profuse bloomer in my collection, should be in every garden.

9th, "Lady Beaconsfield," salmon, pink and primrose, not of largest size but fine form and a charming combination of colour.

10th, "Lady Penzance," a cherry pink with pale carmine veining, a unique colour, good form and profuse bloomer.

11th, "Fire Fly." The best red to date, not large in size or of the best shape, but very brilliant in colour.

12th, "Boreatton." The best dark sort, an old favorite, deep velvety, maroon and claret.

Such a collection would require at least sixty feet of trellis, and if well grown should produce not less than fifty thousand trusses in the season. Do not think that that is far too many, if you have lots of friends—and what gardener has not when he has flowers to give away ? You can easily dispose of a great many more than that. Of course twelve kinds does not include all that are worth growing ; if you liked you could very well add another dozen to the number, every one of them desirable flowers to have. To my taste the second best dozen would be made up as follows :—"Lemon Queen," a fine white with a touch of yellow on it the first day after it opens ; "Blanche Ferry," pink and white ; "Daybreak," a new American variety, white and scarlet ; "Mrs. Gladstone," blush and pink ; "Splendor," deep pink ; "Venus," salmon pink ; "Princess of Wales" blue

and white striped; "Gray Friar," should be bluish gray but is often spoiled by dark stripes or blotches, inherited from "Senator," from which it has been selected; when perfect it is a very fine flower; "Stanley," purplish maroon; "Dorothy Tennant," mauve; "Duke of Clarence," dark mauve and purplish blue; "Captain of the Blues," the best blue.

No doubt some of you will think that it is all nonsense growing so many kinds, but I can assure you there is a great deal of pleasure to be derived from taking any of our garden flowers, sweet peas, asters, poppies or any other flower you prefer, growing all the available varieties of it, making a thorough study of their habits and pecularities, and discarding the inferior sorts, retaining the kinds that please you most for future use. Then the next year take up some other flower, pursue the same course with it, and in a few years you will have acquired a knowledge of the floral kingdom, and developed an interest in your garden, such as you never dreamt of in the old days when you were content to plant the same few papers of mixed seeds year after year.

Dr. WALKEM: When we were up in Manitoba this year all the visitors were struck with the extraordinary character of the sweet peas, not only beautiful in color but very large size, far exceeding in size any grown in this part of the country, where they were not as good as usual. I would like to know whether there is anything in the soil or climate of Manitoba that would give these surprising results. We noticed also that all the ordinary garden flowers there were very much brighter than those grown with us.

Mr. WHYTE: I do not think soil has any particular effect, especially if you feed them and water them well—particularly water. Sweet peas should be soaked every second day. This year I had only to water my peas once, but we had rain every three or four days all summer. In Manitoba the heat is not very great, and the soil is very rich This year a friend of mine had the finest specimen of "Lottie Eckford" I ever saw; far better than I grew, but the reason was that he had them in some shady place and the soil was very rich and he watered them well. The flowers were 30 per cent. larger than any other.

Prof. SAUNDERS: I think there is one other element connected with the sweet peas in Manitoba and the Territories, and that is the immense amount of sunshine they have there. Why, their hours of sunshine exceed ours by from twenty-five to fifty per cent. taking the season through, and there is no doubt that that has a very important bearing indeed on the size of the flowers of the sweet pea. The same thing, however, you will notice in parts of British Columbia where they are deficient in sunshine. There it seems that the extra moisture, added to the richness of the soil, makes up to some extent for the lack of sunshine, although I do not think the sweet pea in British Columbia, taken as a rule, will be often as large as those grown in Manitoba and the Territories. That peculiarity is not confined by any means to the sweet pea. I have noticed it in connection with a number of annual plants, particularly stocks, verbenas and also asters; I think they are finer than they are with us, showing that this great amount of sunshine is a very important factor in bringing out the greatest perfection in beauty and size and color of flowers.

A DELEGATE: Did you ever find a difference in the direction of planting the rows east and west or north and south?

Mr. WHYTE: It is generally believed that north and south is the better way so that you get more sun both in the morning and the afternoon. I have not followed that because it is not convenient; I do not see any difference.

Prof. SAUNDERS: What experience have you had of planting seed in the autumn?

Mr. WHYTE: I have not had any experience, but I have a friend who regularly plants just before freezing, and he says he has his peas a week or two weeks earlier than when they are planted in the spring.

Prof. SAUNDERS: From the strong statements being made that it was an easy thing to do, I thought I would try it myself last year, and I took every precaution, following the directions that were published and there was not a solitary pea came up in the spring. I planted them very late.

The SECRETARY: Did you have the usual amount of snow?

Prof. SAUNDERS: No, we did not. It was a hard year, I must admit.

Mr. BURRELL, St. Catharines: We have usually planted them in the fall in the neighborhood of St. Catharines. I have the chicken wire drills 50 or 60 feet long and between 5 and 6 feet high, and we put them in about 5 or 6 inches deep in the fall, and we had them three weeks earlier. By planting diligently we have had flowers almost all the summer.

Prof. SAUNDERS: I suppose a good deal depends on location?

Mr. WHYTE: And something depends on soil too. If it was a very light soil frost gets in more, and they would not be so hardy. Even last year, hard as it was, there was quite a number of seeds came up that were sown the year before.

THE AMATEUR'S ROSE GARDEN.

By Mr. O. G. JOHNSTON, KINGSTON.

We find mention of the rose in the earliest writings, both sacred and profane. It was undoubtedly very generally esteemed and used both for ornamentation on both public and private occasions. As an instance it may be mentioned that the Romans put it to a very significant use at some of their private dinners and feasts. A rose was placed over the principal door, and he who passed under it silently bound himself not to reveal anything that was said or done within. Hence arose the saying "Sub Rosa."

The limits of this paper will not allow me to give a history of the rose, but I will speak rather of the way to cultivate it. There have been so many papers read on the rose and so many good books printed that it is hard to say anything new, but as most of the books written and papers read have been English and suitable to an English climate, therefore they would not do for this climate and are a little confusing to the amateur. This paper is for this locality; further south you should start earlier and further north a little later.

The first requisite in the culture of the rose is the preparation of a suitable place for planting them; the best position is none too good for them. What I consider the best is facing the east, with protection on the north and west. I do not mean protected by big trees but with fences or hedges. The rose likes to have a fairly open exposure with a free circulation of air about it; but when I say that I do not mean such a circulation as would drive a forty horse power windmill. In connection with the choice of location, we must see that the roses are provided with a proper soil; they will do well in any good garden soil free from standing water. The soil of course must at first be thoroughly manured as the rose is a gross feeder. Roses that have been grown out of pots should if possible be planted while in a dormant condition in the spring as it is almost impossible to lift a rose while the sap is running and at the same time have it make a good rose. Roses that are pot-grown can be planted any time in this latitude from the 10th of May to the 10th of October, but if set out in midsummer, a little extra care will be needed in watering them.

Respecting the size of plants that should be set out, I advise those who can obtain them to put out plants of two years' growth. Do not put out bantlings—bantlings are plants sent out by mail, 20 for a dollar. Of course you get a beautiful catalogue with them and a coloured plate of roses. Look well at the picture, as it is about all the roses you will see from plants sent out by mail.

If you have a greenhouse to nurse them in for a season you may succeed with them, but one honest two year old pot-grown rose is worth fifty of the baby roses that are sent out by mail.

In planting the bed, if of more than one variety, the strongest plants should go in the centre of the bed and the weaker ones on the outside. The pruning of roses is one of

the most important features connected with their culture. All roses that come from the open ground should be pruned immediately after planting, as the shock of transplanting must be met by a shortening of both shoots and roots.

The shoots being shortened the number of buds to draw upon the sap is reduced and a more vigorous growth is followed. Pot-grown roses will not need pruning the first year they are planted, as there is no disturbance of the roots in planting them. Plants of delicate habit should have severe pruning; do not prune till the spring as then you can better see the damage that has been done by frost. Besides pruning the plants in early spring, a summer pruning in the middle of July is helpful, in order to induce the formation of flower buds later in the season.

Just here it would be as well to say a few words about planting the rose. I will not take up your time by telling you all the ways it is done by amateurs, but I will tell you the right way.

The heaped up mound of soil that would make a pretty bed of geraniums is not the style of bed to plant roses in. You can elevate your bed above the level if you like, but it should be as nearly flat as possible on top and moderately firm, make an excavation with a trowel or any thing suitable, one inch deeper than the ball of the plant you are going to put in also two inch wider, place the plant in the centre of excavation, press the soil around the ball of roots and fill up level to the surface. Be sure you plant them firmly as more plants are lost by loose planting than by insects.

The distance to plant is about two feet apart. If planting them in a long border I would plant them eighteen inches in the rows and three feet between the rows; that with a good watering will complete the operation of planting. If you syringe well every fine bright day you will find in ordinary weather it will keep the soil moist enough.

About the 1st of June after the roses have broke freely is the time to put on a mulch of rotted manure. They will also be benefited by digging the same in after the summer crop of roses is over, and applying another mulch on top, cutting all weak growth out and shortening the flowering shoots back; if you follow this up you will be gladdened by very fine roses in September and October.

Manure, if new, should never be applied to come in contact with the roots, but may be spread on the surface of the earth as a mulch. All animal manures are useful for roses. Horse manure is much better for heavy soil than for light. Well rotted cow manure is best for light sandy or light black soils, do not use cow manure for any soils that are inclined to be wet and sticky. Before you can grow roses in a wet or sticky soil it must be under-drained. There are also other good fertilizers for the rose, such as soot, spent hops, flour of bone and bone meal. Also a dressing of lime when you dig in the winter mulch in the spring, and another dressing before you put the winter mulch on in the fall. Wood ashes are also an excellent fertilizer for the rose.

During the formation of the flower buds, which will be about the 1st of June, an application of liquid cow manure will help to swell the buds and give texture to the flower. Do not use any after the flowers buds begin to show colour.

Insects.—Just about this time keep a close watch for insects. I will now tell you the principal insects you may expect to find, for although these are not all the enemies of the rose, yet if you keep these down the others will not do much damage. The "aphis" or green fly is a small green louse about $\frac{1}{8}$ of an inch in length, when fully grown, but you should never see it that long, as it will show neglect on your part. The aphis is very prolific in breeding, so look well after it. Much the best destructive agent is tobacco, of which there are several preparations put up for use, or you can boil some tobacco stems and apply with a syringe. The right strength for use is about the color of ordinary tea. Another remedy for the aphis is quassia chips boiled in soft water. The above remedies can be applied with a syringe, or with a whisk broom for a few roses.

Mildew.—The best remedy for mildew is flower of sulphur. This should be applied the moment the disease makes its appearance. It comes in the form of a white downy

appearance on the young tender leaves. The moment that it is seen even if only one spot, sprinkle a little sulphur on the leaf. If there are a number of spots apply the sulphur with the bellows. This is an important matter, as it is a fungus growth that spreads with great rapidity. One moment to-day in applying sulphur is worth an hour to-morrow, as mildew is contagious, spreading from one plant to another very rapidly.

The rose hopper or thrip is perhaps the most troublesome pest with which the rose is afflicted in the open air. It is a small, yellowish white insect, about the one-eighth of an inch long with transparent wings. They usually prey upon the leaves from the under side and they are very destructive to the plant, making it assume a sickly yellow appearance. By syringing the under side of the leaves, and dusting on white hellebore, it will soon destroy or disperse them to some other rose bushes that are not being looked after.

Red Spider.—This is a most destructive little insect if neglected, but not much trouble in the garden, as they do not like water any better than tramps do, so by keeping your roses syringed from the under side you are not apt to be troubled with them.

I have now named the principal insects and diseases of the rose, and told you how to keep them away. If you keep your roses free from the above insects you will sure to have fine roses.

I will now say a few words in regard to varieties to plant. The twelve varieties of roses that I would recommend to plant in this latitude are not what you are apt to see recommended as the best dozen in a catalogue. It is only human nature to recommend what you have got in stock, but the twelve I recommend I consider the cream of several best dozens. These are :—

Anne de Diesbach, Baroness Rothschild, General Jacqueminot, Mabel Morrison, Jules Margotin, Magna Charta, Louis Van Houtte, Paul Neyron, Melville de Lyon, Prince Camille de Rohan, Alfred Colomb, Marie Baumann.

The roses I have mentioned are all perfectly hardy in this latitude, and are also good autumn bloomers. They also embrace a good variety of colors. Any one who has not seen these twelve beautiful roses in bloom in the early morning, while still wet with dew has missed one of the greatest pleasures of life.

I will now say a few words about climbing roses. The three I consider the best for this climate are :—(1) Baltimore Belle, blush white ; (2) Prairie Queen, bright rosy red; (3) Seven Sisters, light blush. These varieties will bloom profusely in mid summer the following season after planting. The care they require is identical with bush roses, excepting pruning. All the pruning they require is to cut the thinnest wood out in the spring and also what is winter killed.

You can either lay them down in the fall and cover with light material or cover them up as they stand. I prefer to lay them down. Just here I would say do not be in too great a hurry to take off winter mulch. About the 1st of May will be about right for this latitude, for I find that if taken off before the sharp frosts that we sometimes get in the latter end of April it does them an injury. When you take off the roughest of the mulch and prune and fork the bed over, there is nothing further to be done except to watch out for insects and mildew, and syringe on all fine sunny days.

Just here I would say, the amateur who is likely to get the most roses and the most enjoyment from his garden is the one who will work from five minutes to fifteen minutes every day ; and the one who will get the least roses is the one that will go out in the garden in the spring, throw his coat off, work all day, get tired out, and never go near the roses again till they are all mildew and eaten up with insects. This picture is not overdrawn, as I have seen it done this way myself.

To have beautiful roses you must always have them with you in mind and heart. And now, if this paper has made anyone here feel a longing to grow roses, I would earnestly recommend them to purchase a book about roses, written by Cannon Hole. This book of 322 pages is a charming compilation by a gifted writer, who, though an amateur,

has done more to further the growing of beautiful roses than any other man. No one has written on floricultural subjects so lovingly as Canon Hole, and his book on roses no amateur or gardener can afford to be without.

Prof. SAUNDERS: I think the remedy Mr. Johnston suggests for the thrip, which is the most troublesome of all insects—the application of hellebore—would hardly be sufficient. The other remedy referred to, tobacco, is an excellent one; but the reason why hellebore is not an efficient remedy for thrip is that that insect is furnished with a beak with which it punctures the under side of the leaf and sucks the sap out. It could not possibly get enough hellebore to do it any harm, because the puncture is so small. If it could be made to eat the hellebore no doubt it would poison it, but as that class of insect does not subsist in that way it is impossible to reach it with Paris green or hellebore or any of these things that require to be eaten in order to poison the insect. It does not do to apply the tobacco syringe on the thrip when the insect is an eighth of an inch long and wings fully developed, as Mr. Johnston has well described it in the adult state; but in the young state that insect is a soft-bodied wingless insect practically in a larvae form. We put four ounces of tobacco to a gallon of water and boil for three or four minutes, and it is better to add soft soap. The nicotine in the tobacco and the alkali in the sap penetrate the body of the thrip and poison it. There is one other insect which we find exceedingly troublesome in Ottawa, that is the leaf roller. It gets into the bud of the rose quite early in the season and very often eats out the substance of the bud before the flower has time to expand. That is very easily got rid of by soaking the plants, when the leaves begin to expand, in a preparation of a teaspoonful of Paris green to a pailful of water, and we invariably adopt that plan in Ottawa, where we have some 200 varieties of hybrid perpetuals, and we have all the varieties I think Mr. Johnston has referred to. I think Mr. Johnston has given us a great deal of information, and I feel very much indebted for his practical paper.

Mr. JOHNSTON: I do not like to recommend Paris green because my garden is not an experimental farm; it is not a rose garden to make money out of; it is an amateur garden with a man that has four or five children. I don't know what kind of children some people have, but mine will go around and smell the flowers and put them in their mouth and taste them. I should be very sorry to have roses spread with Paris green, in the smallest quantity, as it is a deadly poison. We use Paris Green, but it is in the green-houses outside of the garden. In a great many cases it is absolutely necessary to use the Bordeaux mixture, but for private gardening it is not wise. As regards the wingless insect I claim that white hellebore put on its body while in a larvae state will kill it; and if you catch a few of them in a larvae state at any time and roll them in hellebore they won't roll in anything else. (Laughter.)

Prof. SAUNDERS: There would not be much profit in growing roses if we had to catch each one of those larvae and roll them in hellebore. (Laughter). That reminds me of an argument a man used with me at one time to show the utter inefficiency of Paris green. He brought me a potato bug that he had put in a bottle of Paris green and rolled in it till it was completely covered, and the insect was throwing its legs about and enjoying itself in this Paris green as well as if it would in flour or anything else.

Mr. JOHNSTON: That was a hard-shell bug, not a soft-shell bug.

Prof. SAUNDERS: I asked this gentleman what he would do if he was thrown into a barrel of Paris green—would he open his mouth and eat any of it? He thought not; he would keep it shut. Of course that was a hard-shell insect. I have tried the hellebore with the thrip in all stages of their growth, and I never found it of any material benefit. I think Mr. Johnston is too nervous on that Paris green question. Where a teaspoonful of Paris green is put in three gallons of water and stirred, and made a fine spray of, the quantity you will find on any one rose is so infinitesimal that if a child could get it all in its mouth it would only act as a very gentle tonic and never do any harm. In the old days arsenical preparations were very commonly used as tonics. I have never yet known of an instance where Paris green, which is so universally used over the civilized world, if carefully sprayed on plants or trees or shrubs, diluted to about a pound to 200

gallons of water, has ever done any harm. Farmers who were prejudiced against Paris green and afraid it would kill their cattle are now converted to the opposite side; and I think that Paris green for the roses can be used without danger at all if used in that way; but if anyone fears to use it hellebore will answer the same purpose.

Mr. JOHNSTON: I quite agree with what you say about the Paris green, but I am alluding to where you have a few roses, and where the lady of the house does not send for a quarter of an ounce of Paris green but for a quarter of a pound, it is so cheap, and you cannot get her to put on that small quantity; she thinks if a little is good a lot is better. It is all well enough around an experimental farm where everything is done just so.

Mr. BURRELL, of St. Catharines: I should like to ask Professor Saunders if it is true as stated by several entomologists that I know, that hellebore does kill by contact.

Prof. SAUNDERS: I think it has some effect upon the gooseberry saw-fly worm by contact; that is a very soft bodied larvae. I have known them die in ten minutes by the watch after being sprayed with an application of that sort, and I think there would be hardly time enough for the hellebore to kill them by being taken into the body.

Mr. BURRELL: I have used it on the pear slug purposely for that. It has a soft and almost sticky body, and I always fancied it killed by contact, more so than Paris green. I should like to ask Mr. Johnston what is the best soil for roses.

Mr. JOHNSTON: Good firm soil is the best.

Mr. BURRELL: Light sandy soil is not good?

Mr. JOHNSTON: It is not good; it is almost impossible to make it good for roses.

Mr. BURRELL: Do you know anything about this Climbing Rambler; is it any good?

Mr. JOHNSTON: I would be very sorry to say. I have about a hundred to sell. Wait till I sell my hundred and I will tell you about it.

Mr. WHYTE: Does not the hellebore affect these insects by closing up the breathing pores and preventing them from breathing, the same as any other fine powder would?

Prof. SAUNDERS: I do not think that it very often occurs that an insect is killed by inhaling any dust like that through the breathing pores. The breathing pores of insects are covered with a very fine exquisite network to exclude all particles of dust. It is so very fine netted that while it will admit the air it will almost effectually keep out all particles of dust. The pyrethrum powder will kill insects, but that is known to be because of a poisonous element in the powder. In regard to the pear slug the hellebore is no doubt very effective on that, but I have always found the Paris green equally effective, and although the pear slug is a very soft-bodied insect I do not think it is so easily killed as the larvæ of the saw fly. Although soft, it is covered with a slimy, sticky exterior, and I was very strongly impressed with the vitality of the creature some two or three years ago. I tried some experiments to kill them with dust. I selected a leaf on which there were a number of these slugs and peppered them all over with dry sand and isolated this leaf so that I could watch them, and I found that they had all crawled out of this coat and got a new coat underneath. I tested them in a few days again and they came through the same way with a new coat on, and I gave up the experiment feeling that there was no practical value in the use of dust for killing that insect. It shows they are not killed so easily as some other insects are with slight applications.

Mr. WHYTE, of Ottawa: One of the most important considerations in keeping the roses free from insects is to be in plenty of time with your applications. A great many people wait till they see the insects on them; then they are too late. Begin early in the season before the leaves are formed. To save spraying with this thing and that thing I compounded all my elements and did the whole thing with one spraying; that is, I boiled the tobacco and added whale oil soap to it and the hellebore, and made one application, and it was most efficient.

Dr. Walkem: What is the best mode of protecting roses in the winter time? I found manure ineffective and ultimately I took to covering them with earth. My experience is that that is the best mode of protecting them. I had a great deal of difficulty with hollyhocks; they completely died out and it was very difficult indeed to protect them.

President: I will ask Mr. Race to answer that question and also say a few words on rose culture. Mr. Race is a grower of a very large collection of varieties.

Mr. Race: What I know about the rose is purely as an amateur. I have no roses to sell and never do sell them, although I have been frequently sold by them (laughter). I have had considerable experience in both propagating and growing the rose. In fact I have been frequently referred to as the crank of Western Ontario on the rose. I am not a crank, for a crank is a thing that requires somebody to turn it, while I have yet to meet the man or woman that has been able to turn me from my conviction that the rose is the queen among flowers (applause); that with a very little common sense and a very little labor any man or woman that has a small piece of ground can grow a beautiful rose and should do so, not only because the rose is the most beautiful flower, but I believe that its influence on the grower, on his family and his friends is such as to justify any man or woman giving a great deal of attention to it. I give a great deal of credit to the rose for the very excellent character that I have myself (laughter), and it has done a great deal in moulding my family; and I know my neighbors must love the rose because they come to my garden a very great deal in the summer time, and I do not suppose it is because they love me or come to see me (laughter). While I agree with a great deal that Mr. Johnston has said in his paper, I think he is making the matter a little bit too difficult. My whole effort in speaking on the rose is to make it just so simple as to encourage everybody to go into the cultivation of that flower. It is the easiest matter in the world to grow the rose. I have seen the rose growing in many of the States and in England, but I can show you in my own garden just as beautiful roses as they can produce anywhere. The first thing in order to produce a beautiful rose is to have that beautiful rose in your heart and mind, that is, to have the love for the rose. Love will overcome all obstacles no matter in what direction. The first thing to do is to have your ground very rich. I have my ground so immensely rich that I can produce almost any amount of wood in most varieties of roses that can be grown, and thus I overcome the difficulties of a great many of those insects because I almost defy the ravages of the green fly. I let them feast away upon my roses and yet they cannot check the growth, it is so rank; but the next best thing to deal with that green fly is the finger and thumb. I am not at all delicate in going among my roses, for I get up early in the morning, as most newspaper men do, and I take them between my finger and thumb and clean them off; that is about all I do for the green fly. The most destructive insect to my roses is the leaf roller. For that I use Paris green water. Sprinkle it on early in the season just as the leaves are coming out and just as the buds are forming. You will find that that leaf roller will roll up in the leaf and it will come out in the night time and take a bud, generally the choicest, eat a hole right in the centre and destroy the flower. Paris green is the best thing for that, and the man who is so careless about his premises as to be afraid to have Paris green on them is not going to make a great success in cultivating roses. There is a discrepancy there somewhere. I use sometimes hellebore, but I prefer Paris green because it requires such a very small quantity of it. Then with the very rich ground and plenty of sun and a little bit of attention of that kind, you can produce all the roses that you like. I produce my roses to give away, and I have more pleasure in giving them away than I do in looking at them; and I will tell you here that there is nothing in the world that will bring any person so many friends as as to have a nice rose garden. I know that my friends multiply exceedingly during the rose season (laughter). I have now about 200 varieties, but I can pick out 25 or 30 varieties from any catalogue and produce more beautiful bloom than any man can from 500 varieties, because they will be assorted so that they will give much more bloom. I would recommend you to get a few standard varieties and stick to them until you want to go into larger extension. The collection that was given is a very good dozen

indeed, but I think it might be improved upon. I think the white rose, Madam Plantier, was dropped off. I would not drop it off. The only objection to it is that it has a short season, but it produces a beautiful effect while it is in bloom. It is a magnificent bearer for about two weeks, and it is really worth all the trouble that there is in producing it just for the sake of these two weeks. I protect my roses almost entirely with maple leaves. I allow them to grow as high as they will grow, then bend them over and lay a stick of wood or something to keep them, and spread them over with maple leaves. Where I have them in squares I trench them right up as high as I can in the fall with soil on each side and then also cover them with leaves, but my largest patch is along a lattice fence, and I bend them down through the fence as well as I can and lay a piece of wood on them and cover them over with leaves. This is all the protection I ever give them. I bring my roses through the winter without any difficulty in any way. I do not remove that covering until pretty well on in the season, and when I uncover them I trim them back pretty short and after the blooming season I then manure my roses. With a trowel I remove the soil from the roots and put in just a little of very rich manure around about the roots and cover it over with that same soil. I can make the Magna Charat variety bloom nearly all the season by treating it in that way. In the fall I mulch my rose-buds with manure, and after that lay them down and put on the leaves. (Applause.)

The President then introduced Mr. Herrington, of Napanee Horticultural Society, which is one of the seventeen or eighteen branch societies affiliated with this Association.

NAPANEE HORTICULTURAL SOCIETY.

By Mr. W. S Herrington.

Fruit growing is neither a vocation nor an avocation of mine, and it would be the basest presumption upon my part to attempt to instruct the members present in any branch of that important industry. I might entertain you, however, were I to relate to you some of my interesting experiences in raising berry bushes. Berries, I have none. Such entertainment to a gathering like this would be profitless, so I shall desist. As a member, a charter member, and a director of the Napanee Horticultural Society, distinctions of which I am proud, I can speak authoratively as to the progress that organization has made in Napanee, and the benefit it has been to the individual members and the town as well. Through the energy and perseverance of Mrs. Wilkison, whose vegetable and flower gardens have been the objects of envious admiration for years, we sprang into being in December, 1894. Our first praiseworthy act was to become affiliated with this Association. For this I am sure you will at least give us praise. Those of us whose gardens are limited to a few square yards in summer and a flower stand in a south window in winter need instruction and advice in the culture of the few flowers which give us so much delight and pleasure. Most of the reading matter in your annual report and in the *Horticulturist* may be interesting to the fruit grower and doubtless is relished and enjoyed by him, but can't you devote a little more attention to the grower of flowers. It may be that we overestimate our own importance, but I leave it to you to decide as to the justice of our request. I am pleased to note that this year's program is more in harmony with the wishes of the floriculturist than those of former years.

To return to the working of our own society:—In the first place we pride ourselves in being the only society that is abreast of the times in having a lady President. We have not during the two years of our existence increased our membership very much. We now number about 70, but our zeal and interest in the cultivation of flowers has multiplied a hundred fold. The funds at our disposal, about $200, have been principally invested in the purchase of bulbs and seeds for distribution among the members, believing this method to be the surest way of inducing them to become practical. In this we have not been disappointed. A friendly competition now manifests itself on every hand. One member who had never grown a flower before he joined the society, imported this fall no less than 2,000 bulbs from Holland for his own use. The fragrance of the hyacinth now

pervades a hundred houses, and bright blossoms adorn a hundred windows that two years ago were barren. Every member who has a few square yards about his lawn to spare has laid it out in flower beds, and now throughout the summer months gay and artistic bouquets are profusely arranged on hundreds of mantels where heretofore the cheerless bric-a-brac held sway. The contagion is not limited to individual members, but the town authorities, having a due regard for the new-born taste of the citizens for lawns and boulevards, are relaying the sidewalks nearer the centre of the street so that the driveways are narrowed, but the lawns extended. A neglected cemetery, which had degenerated into a veritable wilderness of weeds, has come in for its share of attention. It has been remodelled, all rubbish has been cleared away and what was formerly an unsightly mass of underbrush and weeds now slopes in graceful avenues to the river's edge, crossed by avenues and paths with beds of flowers on either side. The plots are being levelled and sodded, and tottering tombstones are being restored to their proper positions or new monuments taking their places.

The directors have had under consideration for some time plans for the opening of a public park in the heart of the town; which plans they hope to be able soon to carry out.

Most astonishing and satisfactory results have been produced, and a lively interest awakened in the practical study of botany among the students of the Collegiate Institute, by giving prizes for the best collections of classified and uniformly mounted wild flowers. The prize collections were donated to the Herbarium of the Institute. The first prize collection consisted of 126 neatly mounted and classified specimens.

One Sunday in the year we set apart as flower Sunday, upon which occasion we decorate every church in town, our efforts in this direction have been greatly appreciated.

Our grandest achievement was our first annual flower show held in the month of September, which proved a brilliant success. The display of flowers surpassed anything ever before seen in our town, both in merit from a purely floricultural standpoint, and in the exquisite taste manifested in the arrangement of the specimens. The show was held in the evening in the Town Hall which proved too small to accommodate the large audience. Want of room was our only draw-back. The stage was one mass of brilliant blossoms, through the centre of the hall were arranged pyramids of potted plants while every corner and unsightly projection was hidden behind a bank of flowers. From every gas jet and curtain pole hung garlands of green. The mingled fragrance of ten thousand blossoms filled the room. To a good natured audience, made doubly happy through the medium of two senses, was presented a musical program to a third. This of course entailed a great deal of work upon those who managed the undertaking, but all felt amply repaid. The words of praise and encouragement they received spurred them on to continue the good work with renewed energy and enthusiasm.

This fall we imported 5,000 bulbs from Holland which were distributed among the members in addition to a generous distribution of bulbs and seeds last spring. We have met with success in the past and our future is bright and promising. We earnestly recommend the organization of Horticultural Societies in every unrepresented town in Ontario.

The SECRETARY: This subject of flower-culture is under consideration by us, and will be brought before the directors at their first meeting, and it is quite likely that the suggestions made by Mr. Herrington will be followed up in a large measure, and we shall be able to devote a large space in the Journal to floriculture, or perhaps enlarge the Journal so as to include it, and we hope that our Horticultural Societies will themselves help to amend matters by contributing freely on this subject. They could give us their experience and help us wonderfully in making that department interesting.

FRUIT GROWING AND DAIRYING.

By J. A. Ruddick, Dairy School, Kingston.

When your secretary did me the honor of asking me to prepare a paper for this convention, upon the relations between fruit growing and dairying, my first resolve was to decline, for I realized my inability to do the subject justice. When I noticed, however, that he asked me to merely lead off in a discussion, it seemed to make the way easier, and I am here to do what I can. My experience in growing fruit has been very limited. I may know something about dairying, having made it my life's work so far, therefore I fear this will have to be rather a onesided discussion as far as I am concerned.

What are the relations between fruit growing and dairying? Have the two lines of work anything in common? At first glance there may not appear to be much. I do not suppose that anyone present will disagree with me when I say that I think if a man is to make a success of fruit growing he must be possessed of rather more than average intelligence, for there are many things which he has to consider calling for a high order of judgment and much study in order to make the best of his situation. I may tell you also that the successful dairyman is a man who is able to do some clear thinking, and one who must ever be ready to adopt improvements in order to keep abreast of the times.

Both lines of work demand the exercise of considerable commercial tact and judgment in order to secure the best returns at the market end of the business. Both have many things to contend with, and while the fruit grower is fighting various kinds of insects and parasites which prey upon his crops, the dairyman is contending with insects such as the horn fly and other flies too numerous to mention, to say nothing of those minute forms of life which the bacteriologist points out as being so injurious under certain conditions to dairy products in one form or another. This is the spraying age, but the fruit grower must not think that he has a monopoly of it, for kerosene emulsion is highly recommended as a remedy for the horn fly and it is applied with the ubiquitous spray pump.

It seems to me that if a man possesses those qualities which enable him to make a success of fruit farming that he is eminently fitted to become a good dairyman, providing always that he has the special knowledge which is necessary to success in either line.

Speaking of special knowledge brings me to say that this is a feature of dairy work —and I think fruit growing also—which always appears to be a most encouraging one. Men usually get paid in some way or another for special knowledge if they exercise it properly, and there are certainly no other branches of farming to-day which offer a better field for special training and skill than do these two under discussion.

Seasons like the present, with its immense crop of apples and comparatively low prices, open up the question of utilizing the surplus or inferior fruit as food for milch cows. I am informed that large quantities of apples are being fed in Western Ontario during the present season, and it is reported that the flavor of the cheese is affected thereby in some sections. Fortunately, or unfortunately, I scarcely know which, we do not have many seasons like this one from which to draw conclusions, but one thing is certain, that apples can only be fed safely to milch cows in limited quantities. A few quarts at a time at first, gradually increasing to about half a bushel per day, is as much as a cow can assimilate without causing indigestion, and consequently a derangement of the nervous system, and thereby a decrease in the flow of milk and injury to the flavor of what is given. If it is true, as I am told, that some farmers are allowing their cows to run in the orchards and gorge themselves upon the fruit, I am not surprised to hear that bad results have followed. Any food, no matter how good, unless it comes pretty near being a balanced ration, if fed in excessive quantities, will produce the same deleterious effects.

Stewart gives the composition of apples as follows: Water 83.1 per cent., ash 0.4, albuminoids 0.4, fibre 4.3, carbohydrates 11.8, fat —, and the nutritive ratio 1 to 43; so that it is clear apples are far from being a balanced ration. It is quite safe to conclude,

however, that any bad effects which have resulted from the feeding of apples may be blamed to injudicious feeding rather than to the unsuitability of the food.

The feeding value of apples is considered to be about 13c. per 100 lbs. or 10c. per bushel. To this, under certain circumstances, might be added the value of the element which we call succulence, but which is not taken into account by the chemist in his analysis.

Succulence in a supplemental food has very little value when the cows are on fresh grass, but, when the basal ration is a dry one, it has a very important effect in stimulating the flow of milk.

If I were engaged in fruit-growing and wished to add a line of dairying to my business, I should certainly go in for winter dairying. A few years ago, when some of the leading dairymen began discussing the possibility of carrying on the work of the dairy during the whole year, and when, in the fall of 1891, Prof. Robertson had two cheese factories in Oxford County fitted up for the making of butter during the winter, there was much speculation as to what the result would be, and not a few of the wiseacres predicted failure for the experiment. They have been disappointed, however, for there are to-day over one hundred winter creameries in Ontario and a great many in Quebec, and the number is increasing very fast. This surely demonstrates the practicability or producing milk and making butter during the winter season.

It has been shown in many cases that cows which come in during the fall will give more milk at a profit than those which come in during the spring. This plan brings the cows dry during the time that the fruit grower would be most engaged harvesting his crop, and would enable him to distribute his work over the whole year to better advantage than any other.

With improved facilities for handling our butter so that it may be placed upon the markets of Great Britain in the best possible condition, and greater attention being paid to that branch of dairying, there is likely to be a large increase in our output for several years to come, and it may not be long before Canadians are receiving as much for their exports of butter as they do at the present time for the cheese, which constitutes such an important item in the volume of trade with the Mother Country.

The PRESIDENT: The subject is a very interesting one for the farmers of this district, and I trust it will be thoroughly discussed.

The SECRETARY: It is claimed by some people in our section that when cows eat apples freely it dries up the milk to a certain extent. You do not think that is the case in ordinary quantities?

Mr. RUDDICK: If cows are allowed to eat apples to such an extent as to cause indigestion, the flow of milk will certainly fall off. Apples must be fed in small quantities at first and increasing to not much more than half a bushel per day. Indigestion causes a falling off in quantity and also in the flavor of the milk. Turnips are fed judiciously in limited quantities without any bad results, but if they are carelessly fed, the milk is entirely ruined by giving it that particular flavor which is so perceptible in butter and cheese. Various kinds of grain, by feeding in excessive quantities, will cause indigestion. A cow can only assimilate a certain quantity of feed. The trouble about feeding apples is that we know so little about them and are apt to make mistakes. We are accustomed to feeding grain and that sort of thing, and these grains come so near being a balanced ration. Apples are a very wide ration, being 1 to 13.

Mr. BOULTER: By experiment, we found that green tomatoes fed to cows will increase the flow of milk. We have actually had our milk come back equal to what they do in June in the highest flow of milk, and they are very fond of it; but we do not allow them to eat apples, because they nearly all dried up, eating in small quantities. Will feeding turnips after the cows are milked affect them as much as feeding them before?

Mr. RUDDICK: Decidedly not. I would not like to be understood as advocating the feeding of turnips to cows in any way, as it is too dangerous a practice. I do know that

turnips are fed without bad results at times, but it must be after milking and only in limited quantities.

Mr. BOULTER: If they are fed in the natural state, the cows eat them very slowly.

Mr. RUDDICK: I don't know that it makes much difference whether they are cut or not. I think milk takes the flavor of turnips by absorbing the odor if the milk is allowed to remain any time near where the turnips are. It is not quite clear as to how much milk will absorb those odors, but it is generally believed now that milk will absorb the flavor of ensilage. In any barn where there is silo there is more or less smell—not unpleasant—from the ensilage. In the early days the feeding of the ensilage was blamed, when the real cause was leaving the milk exposed to the odor of the ensilage.

Mr. BOULTER: My theory is that cows should have a dry feed in the morning before they are milked, then the ensilage following right after, with turnips, then a dry feed before they are milked.

Mr. CASTON (Craighurst): This year I fed apples to cows, beginning in a small way and gradually increased the ration till I got to half a bushel night and morning—that is, a bushel of pulped apples, mostly Russets. We had an increase of milk. I was pleased with Mr Ruddick's suggestion of winter dairying for fruit-growers, as we have a good deal of spare time in the winter and it would be a valuable side line.

Mr. GROFF (Simcoe): Don't you think a great deal of difficulty is caused by feeding sour and scrawny apples? I think the best authorities claim there is nothing equal to the carrot as a stimulant.

Mr. RUDDICK: It is a question of cost of production very largely. Carrots come rather expensive because you cannot get so large a crop as of some other varieties of roots. I am not able to compare the values of apples and turnips as a food. I think the apples if fed judiciously would be the cheaper food. I am satisfied all this trouble about the cows falling off in milk has resulted from feeding too largely at first. A farmer would think nothing of giving half a bushel of apples to the cows the first time they had any at all. That many apples given the first time would be almost sure to bring a fit of indigestion. To begin with a few quarts seems small, and the farmer would think it hardly worth while. The falling off in the flow and the injury to the flavor of the milk are both due to the same cause, I think; but I am not a practical feeder, and do not know anything of it from experience. I am not in a position to speak with any authority as to the comparative value of foods.

Mr. PATTISON (Grimsby): For the last ten years I have fed apples to cows every season, and I can corroborate Mr. Ruddick in saying that if apples are judiciously fed from the start there is no danger whatever in drying up the cows; indeed it increases the milk; but you must begin with a few quarts. I seldom feed as much as half a bushel at a time even after they have become accustomed to it.

Mr. RUDDICK: Half a bushel per day was what I gave.

Mr. BURRELL: There has been a long discussion in some States this year about feeding. Mr. Woodward suggests feeding apples in a small quantity, but they lay great stress on having them ripe and sweet. Where indigestion follows it is a good plan to give a pretty heavy ration of corn meal to counteract that.

Prof. SAUNDERS: I think the experience in Europe as well as in this country has shown that the feeding value of apples, looked on as a food pure and simple, is about the same as the feeding value of turnips; but there are other points about the feeding of roots and of fruits that have to be considered. We know ourselves that if we eat a little fruit sometimes before breakfast or dinner it gives us a better appetite for the other part of our meal, and we are able to eat and digest things to advantage that we could not do without that addition to our diet. I think it is the same with animals, and judicious feeding stimulates the appetite and promotes digestion away beyond what you would expect from the chemical constituents of those foods. That is an important point for the farmer to bear in mind; and variation in the diet of animals would no doubt help them.

Of course it must be done judiciously. To feed a cow with half a bushel of green apples would be the same as a boy eating too much green fruit ; it would result in internal disturbance and disorder. Every farmer must use his common sense and give judiciously. As to growing carrots, our crops this year at Ottawa, with those short white varieties and mammoth intermediates, have given us from twenty-eight to thirty-two tons to the acre, which is almost as large as our crops of turnips this year, and indeed larger than we generally have. I think the feeding value of carrots has been established by chemical analysis to be higher than any other root except sugar beets. At our experimental farm at Nappan they can grow thirty-five to forty tons of turnips to the acre with ease, whereas they cannot grow more than half that quantity of carrots. There turnips are the most profitable. We must all learn to think and act for ourselves and consider our localities and climatic peculiarities, and grow the best and most economical feed that we can produce, so as to bring down the cost of feeding as low as possible.

The SECRETARY : If the feeding value of apples is equal to that of turnips I think it is important for us to know it, because then we fruit growers do not need to go to the trouble of growing turnips at all, we have such a surplus of apples that are not fit to ship, and we are very glad if we can get anything like fifteen cents a bushel. I suppose that would be the value of turnips.

Prof. SAUNDERS : You would have to take about one-third of that.

The SECRETARY : If we can get even seven cents or ten cents in feeding value we ought to be satisfied.

Mr. BOULTER : The apples would not last as long as the roots would to feed.

The SECRETARY : They could be kept very well till the spring.

Mr. PATTISON : I think if they were stored in pits they would keep very well.

Mr. E. D. SMITH, Winona : It seems to me that the two branches of farming—fruit growing and dairying—are intimately connected in this way : That the fruit grower requires large quantities of manure, and that by keeping cows in the winter particularly, and utilizing them in the way that most of the work comes in the winter, by butter-making, he will divide the work up, and at the same time get manure in the cheapest way.

Prof. SAUNDERS : We know that the apple in growing the food makes a heavy draught on the soil for potash, and the cow would not utilize any part of that potash, but it would all go back to the soil for manure. That is also a point worth mentioning in maintaining the fertility of the soil of orchards.

Mr. PATTISON : The feeding of milch cows in winter would involve the growing of a great deal of bulky fodder, if not hay at all events some other form, which might be coming at a time when they would be busy in the orchard, and involve considerable difficulty in harvesting it.

Mr. CASTON : I think that would be largely solved by growing corn, of which you can grow on a small piece of ground enough to feed a great many cows during winter ; and that would be a valuable way of getting manure. Where large areas are utilized for fruit growing how do they manage to get manure? I am only growing in a small way, and one of the most troublesome questions I have is to get hold of enough manure. I utilize commercial fertilizers, but it is very costly, and it is a question whether the game is worth the candle.

The SECRETARY : Fruit growers don't keep up the fertility as they ought to.

Mr. E. D. SMITH : That is so, they have not kept up the fertility. In the first place the fruit in the Niagara district is usually planted on extremely good soil. So far they have not been compelled to set it on poorer land. Ultimately they will.

The SECRETARY : The land will all get poor, under present treatment.

Mr. E. D. SMITH : No doubt it will. Of course our experience with grapes is that they require very little fertilizing if set on good land for a great number of years. No

doubt ultimately they will play out. We use large quantities of ashes. We have been able to get all the ashes we require delivered on the land for ten cents a bushel, and we consider that a very cheap means of getting potash. To produce fruit requires usually a very little nitrogen, and so far we have been able to get it. Some keep cows during the winter; others let the land go poor, and a good many are buying from Toronto this compost, mixed manure, which costs about $1.25 a ton laid down at the station. It is quite expensive, but those who have tried it think it is more economical than the artificial fertilizers, which are rather costly, though I believe ground bone where the phosphates are required—and that is the main thing—is the cheapest available supply. I know one or two cases of vineyards that had got to that position that they grew plenty of wood but did not produce any fruit. A good strong application of bone meal in a year or two produced splendid results; the old crops came back again.

The SECRETARY: Have you noticed any special instances of the effect of using ashes on your soil in connection with any of your crops?

Mr. E. D. SMITH: The best results with ashes have always been upon sandy ground, I presume because the potash leaches quicker out of the sandy ground. The application of ashes almost always produces quick results on sandy ground, especially for peaches.

Mr. PATTISON: I have had some little experience in the matter of fertilizers and keeping up orchards. I make it a rule not to grow a great quantity of fruit, but to keep what I do grow well manured all the time. It is possible to keep up a moderate sized apple orchard without a great deal of manure. If your orchard is fenced so as to keep pigs in, and you feed the pigs besides to some extent, the pigs not only improve the orchard but they keep up the land, and a very moderate quantity of manure applied around the trees about once in three years will keep the orchard in excellent condition for years if the land is fairly fertile to begin with. In the matter of other fruits, a good way to supply nitrogen is to sow rye or clover and plow it under before coming into bloom, or when it has got considerable length of stock. That not only supplies considerable manurial elements, but keeps the land in good mechanical condition. I have tried commercial fertilizers, and found them profitable with plums.

Prof. SAUNDERS: What particular fertilizers have you tried?

Mr. PATTISON: I have chiefly tried the Smith's Falls fruit tree fertilizer, and found it a very excellent thing for plums and peaches. My soil being clay, wood ashes are not much needed, though I think an application occasionally is a good thing even on a heavy soil.

Prof. SAUNDERS: This question of the fertilizing of orchards is very important, especially in those districts where manures are hard to get. Potash can nowhere be got more cheaply than in wood ashes at ten cents a bushel. Wood ashes contains from five to six per cent. of potash besides about two per cent. of phosphate of lime. Where ashes cannot be got, kainit is a good fertilizer, containing twelve per cent, and it can be imported from Germany at reasonable rates. Phosphoric acid can be supplied from ground bones, and also from the ground phosphatic rock. There is a third source of this important element that has come to the front in late years, that is known as the odorless phosphate, or Thomas' slag, which contains a large proportion of phosphoric acid. This is a waste production in connection with iron lands. This waste is got by heating the iron ore to about 5,000° F., when a small proportion of phosphorus combines with the lime and forms phosphate of lime. This product was thrown away at the mines until it was found to contain about twelve per cent. to fifteen per cent. of phosphoric acid, and it has now become a large thing in fertilizers, and from three to five thousand tons of it are used in Germany every year in fertilizing lands, and its use in this country is increasing very much from year to year. We have tried it at the experimental farm at Ottawa and have had some perceptible results; but in the use of artificial fertilizers it is not always easy to see the results immediately. Sometimes the season is not favorable for the particular crop, and then the farmer is very apt to form a judgment adverse to the fertilizer, when probably the larger part of that fertilizer is stored in the soil awaiting use in subsequent years. It is a very difficult subject, indeed, to form any very positive conclusions about, but I

think we have evidence enough to see that whenever potash or phosphoric acid is added to the land, if the addition is not used during the following year it is used in subsequent years, and it remains stored up in the soil, taken up by that peculiar quality which enables soil to retain potash and phosphoric acid and yield it for future use. In regard to nitrogen, which is the most expensive of all the elements to supply, I think there is no way in which the orchard can be enriched with that element so quickly as by sowing crops of clover or peas or some other leguminous plant, and plowing it under. These plants have the power of taking nitrogen from the air and storing it up in their tissues, which rye and buckwheat and others have not the power of doing. These latter plants only giving back to the soil what they take from it. (Applause).

Mr. BURRELL, St. Catharines: There is a very important feature of kainit that should be mentioned—its value as an insecticide as well as a fertilizer.

ELECTION OF OFFICERS.

The election of officers was then proceeded with, and resulted in its unanimous return of the persons whose names are given on page 2.

TREASURER'S REPORT, 1895-6.

Mr. WOOLVERTON read the Treasurer's report as follows:

RECEIPTS.

	$	c.
Members' fees	2,581	62
Government Grant	1,800	00
Advertisements	356	32
Binding and bound volumes	20	60
Sample copies, etc	6	88
Amt. due Treasurer, Dec. 1, 1896	41	25
	$4,806	67

EXPENDITURES.

	$	c.
Amt. due Treasurer, Dec. 1, 1895		38
"Canadian Horticulturist"	1,854	69
Sec.-Treasurer, Editor and Assistant	1,200	00
Commission	342	48
Affiliated societies	225	63
Plant distribution	221	04
Directors' expenses	198	13
Chromo lithographs	190	52
Postage and telegrams	135	56
Reporting	122	34
Express and duty	99	43
Printing and stationery	71	82
Committees	39	97
Bookbinding	30	55
Discount	26	48
Auditing	20	00
Advertising	15	70
Illustrations	7	95
Care of rooms	3	00
Exchanges	1	00
	4,806	67

A lengthy discussion then took place on the above report, especially in regard to the items "Commissions," "Printing of *Horticulturist*," and "Premiums." After many suggestions had been made and opinions expressed, it was decided to appoint a committee to consider the matter and report to the Society. The committee was then appointed, consisting of Messrs. Groff, E. D. Smith and Pattison.

REPORT OF FINANCE COMMITTEE.

Mr. Orr read the report of the Finance Committee, which was adopted on his motion, seconded by Mr. A. M. Smith.

We have examined the Secretary-Treasurer's books and vouchers and found them correct, and that the expenditures are in accordance with the objects of our society.

We are highly pleased with the convenient, careful and complete manner in which the books are kept.

W. M. Orr,
A. M. Smith.

ADDRESS BY THE NEW PRESIDENT.

President W. E. Wellington was then introduced as the new President, and took the chair amid applause. He said: I think I am duly sensible of the honor you have conferred upon me in electing me President of this Association. I regard it as an institution for great good. As to the extent of good that we shall bring about, the matter is in your hands. I was very much impressed with the good which the institution has done by the optimistic paper which was read yesterday (laughter). I prefer to take it in that light, as Principal Grant did. I think that the future of the fruit grower is one that need not give him any particular concern or worry. He will have his ups and downs like other men in business. In the past it has been very easy sailing. It was simply a matter of growing the fruit and turning it into good dollars, but of course with the larger extent of planting, there has come about a revolution to a certain extent in the fruit grower's business as well as in other people's. Now, fruit growers who adapt themselves to circumstances are the men who are going to succeed just as they will in other lines of business. I think that this institution should under the altered circumstances give particular attention to the present needs of the fruit grower. I would like to see committees appointed immediately to look thoroughly into the matter of packing and placing fruit on the market. I am satisfied that that is one of the main causes of the losses that have been sustained. True, we have had an extraordinary crop in some things, but that has only added to the difficulty I have mentioned, that is, that fruit is not properly put up as a rule. You may go into Toronto and other markets and in nine times out of ten the package that you buy will be disappointing, It does not run through as it is on the top. While there are many honest packers I am satisfied that there is need for great change in this direction. I am almost persuaded that legislation is necessary to compel men to place packages on the market so that when they do not put up their fruit properly they can be traced, and those who do put up the fruit properly will get the benefit of this honest dealing (Hear, hear). I am satisfied that the honest dealer suffers because of the dishonest dealer. It drags the price of fruit down, and the honest packer becomes discouraged because he does not get the returns that he naturally should expect from his honest endeavor. Then another matter that we should take hold of and seriously consider is that of transportation. I am satisfied that we pay too much for the transport of fruit to the market. I am satisfied that there is a good market for many kinds of our fruit in the northwest, but it is prohibited simply because of the heavy cost of transportation. The same thing applies to the transport of fruit to Great Britain. Then we come to the great necessity of some radical change in the matter of the disposal of fruit after it has got to Great Britain. I am satisfied, to speak plainly, that there is a great deal of roguery and robbery committed on the shippers of fruit to Great Britain. There is too much of this "slack and wet" report, and somebody is getting the benefit of it, because I am satisfied that fruit does not always reach the market in the condition in which it is reported. There is an unlimited market in London alone, and I think Mr. Shepherd will bear me out in saying, if you can only bring your fruit before the consumer and more into his notice. At this stage, gentlemen, I do not want to take any further time, but I merely mention these points for your consideration,

and hoping that I shall have the assistance of every member and the directors of this society in seeing if an improvement cannot be brought about by the aid of the Association (Applause).

Mr. HUGGARD: It affords me very much pleasure to move a vote of thanks to our retiring President. He has officiated over this Association for the last two years in such a way that it has been pleasing, not only to the directorate, but to the public at large. His re-election last year was a very happy reflection on his career the year previous, and there were many expressions of gratitude.

Mr. CASTON had very much pleasure in endorsing the mover's remarks and seconding the motion.

The PRESIDENT stated that he thoroughly agreed with the motion, which he conveyed to the retiring President.

PACKING AND SHIPPING OF OUR CANADIAN APPLES.

BY C. H. WARTMAN, KINGSTON.

I have had an experience of sixteen years as a packer and shipper of Canadian apples to various parts of England and Scotland, and although I have gained many points of practical knowledge, still I find there is room yet to learn something of this trade, as to how to handle and when to handle this wonderful commercial product, the apple. I have crossed the Atlantic six times in pursuit of knowledge on this subject, with apples packed by my own hands, and although some of my apples have sold as high as 28s. per barrel, a very large percentage have brought very much less, and to-day, after this long experience, I find myself financially about as I started. Nevertheless I have gained a knowledge of kinds to ship and the manner to pack that may be of great benefit to me in years to come, and I will gladly try in this paper to impart some knowledge to my fellow packers and growers of Ontario. My experience in packing apples for the British market over 3,000 miles away, has always been in barrels, and its in the first place necessary to procure barrels that will not weigh less than 165 lbs. gross for Spy, Russet, Baldwin, as we know these are among our heavy apples. As apples are all sold by weight in England they look for this weight in a Canadian barrel. I believe we have a standard for our Canadian coopers to go by, but find the coopers that make the smallest barrel to have the largest sale—not knowing the mistake they are making. We have to cater to the wants of English consumers. In our general Canadian apple barrels the staves are too thin, the heading is too thin and the hoops too few. I strongly advise four hoops on the body of the barrel instead of two, so that if two should break there are two others left to hold the barrel in its solid position without expanding, whereas if there are only two and one breaks, it allows the barrel to expand, and after a little rolling it becomes slack.

We shippers know a little about "slack and wet," and "wet and slack." It means anything but profit. As to packing apples for export: In the first place I would have the apples picked as they come from the trees, but in barrels drawn in some airy, cool building to stand four or five days to sweat and shrink. Then pour out on a packing table or on some blanket placed on a clean bed of straw on the floor, so they will not be bruised. As one lot of men get tired of one position they can exchange positions, as the most easy position will become tedious after a few hours' work. In this way you will get more apples packed and not feel so weary at the end of your day's work. I believe in coursing the barrel two courses with average size apples—not the largest that can be found, but a good fair average. Then pour in the balance out of a good sized basket that will nicely turn in the barrel, giving after each basket, the barrel a good lumber wagon shake, if you can understand this. Never failing to do this on something solid, as this is partly the secret of tight and well packed apples. Now as to the exact fulness of the barrel to press, this would depend whether they are shrunk or

fresh off the tree, but in all cases have the barrel pressed tight enough to carry through without slackness, or one-fourth of the barrel will be disfigured with bruises which hastens decay. Although apple salesmen in England say no package is equal to the barrel, I am of the opinion before many seasons roll around a large portion of our apples will be exported in boxes, which will not need to be pressed in so tight as to make our beautiful apples look unsightly and cause decay. Some cannot understand why so large a percentage of our apples arrive slack and wet in England. The cause is largely due to the rough handling they get in transportation. While watching apples transhipped from boat to cars, I have many times been grieved to see them so roughly handled, and have devised a plan whereby labor could be saved and apples could be saved from destruction; but all my work has been in vain as yet. I claim no barrel of apples should drop one inch, as a barrel weighing 165 lbs. will not stand continual drops from gangway to dock and from carts to solid pavements. Where barrels are piled two deep on ends it is not necessary for a man to lift this barrel, but ease it down. All steamboats and freight sheds should be made by law to carry or have on hand at every transhipping place large linen sacks filled with sawdust for these barrels to fall on, where there is any likelihood of any fall whatever. This provision would cost a very little and growers and shippers would reap the benefit. Let one line of boats or railways adopt this plan and others will have to follow suit or lose their apple freight, which is of no little importance.

PICKING, GRADING AND PACKING APPLES.

By L. Woolverton, Grimsby.

There is no question that the fruit industry is one of the most important industries in our province. So rapidly has it developed in some sections of late that the income so derived far exceeds that from any other part of the farm. All this is in spite of the many disadvantages under which fruit-growers often labor, and it is to point out a remedy for these that I write this paper.

The first means of aiding in the development of the apple industry is by *imparting information concerning profitable varieties.* Many of our orchards are full of worthless varieties, fit only for cider. The trees occupy the same space as good varieties, and they cost as much to cultivate and prune; the fruit costs as much to harvest and market, besides glutting the markets and giving our growers a bad reputation, while the margin of profit, if any at all, is the very lowest possible. What do we constantly hear from British salesmen? "Good, sound winter apples wanted; no sale for inferior trash." Second grade apples should not be exported at all, even if of a good variety, and inferior varieties should be top-grafted to those which are most profitable. "Which are these?" is the question always coming up. In this paper I will not discuss this point. In fact, it is a wide question, for every section has varieties suited to it, varieties whose home seems to be there and which succeed nowhere else as well. Two questions, then, have to be studied—(1) the varieties most wanted for the market, and (2) the places where each will succeed.

The first of these questions can only be answered by studying the markets. For instance, this very year, in October, there came the following cable:—"Latest prices for Canadian apples at Covent Garden per barrel are: Kings, 12s. to 16s.; Greenings, 9s. to 11s.; Baldwins, 10s. to 10s. 6d.; Ribstons, 13s. to 15s.; Snows, 9s.; Twenty-ounce Pippins, 9s. to 11s.; Seeks, 9s. to 10s. 6d.; Fallawater, 10s. to 11s. 6d.; Golden Pippin, 10s. 6d.; Blenheim, 11s. to 12s. 6d." The King stands first in this report, Ribston and Blenheim second, then Twenty-ounce Pippin, Baldwin and Greening, and the Snow last.

But when you study these varieties in our orchards, you find the King a poor bearer, Twenty-ounce no bearer at all, I might say, Ribston a weak grower, and the Snow, in southern Ontario, too early in ripening. Thus the one study modifies the other. There is another apple, for instance, which is taking a front place in the British apple market—the Wealthy. This variety has been sold in Scotland for the writer at

17s. 6d., or about $4.30, per barrel this season, when those markets were fuller than ever they were before of Canadian apples. It is everywhere a beautiful apple, perfect in form, beautiful in color, and of excellent quality. It succeeds best in our northern sections and will succeed almost everywhere. Why should not more be grown, instead of the many unsalable varieties now being grown.

We are glad that both the Dominion experimental farm system and the Ontario fruit experiment stations are doing so much to find out the best varieties and the sections for which they are best adapted. Our Ontario Fruit Growers' Association reports will soon become a mine of wealth to every fruit grower. We do not in this paper intend to touch upon the importance of publishing reliable information to fruit growers regarding the methods of planting, cultivating, fertilizing and pruning fruit trees and plants. These are all important, but they are being well and faithfully treated by the Ontario Fruit Growers' Association through its meetings, reports, journal, lecturers, etc.

But there is room for vast improvement along other lines also which count very high in making fruit-growing profitable. First, the *gathering of the crop* Most orchardists do not begin early enough. They will wait until October and then find one-half of their best apples on the ground before the work is done. A neighbor of mine had this year a crop of about two thousand barrels of fine Baldwins. He did not begin until October, and then leisurely picked up the fallen apples before picking from his trees. Toward the end of the month one-half of the crop was on the ground and too much bruised to ship.

In a year like this it would pay to leave all the small and inferior apples unpicked and gather only the best. I ventured this year to ship about fifty barrels of second size, but otherwise first-class, Baldwins to Edinburgh and received a cable to say that they were useless and would hardly bring expenses. Trees that bear small apples should either be cultivated and manured until they bring large fruit, or else top-grafted to large, fine varieties that would pay for handling. There is a great difference in the season of maturity on the trees of our commercial apples, and we would pick them in about the following order in southern Ontario:—Colvert and Gravenstein, 1st of September; Kings and Greenings, 20th to 30th of September; Snow, Wagener and Wealthy, 1st of October; Russet and Baldwin, 1st to 15th of October; Spy, 15th to 30th of October.

Of course it goes without saying that the fruit grower who wishes to make a name for himself must have every apple picked and handled like eggs and not like potatoes, for every tiny bruise tends to make the fruit second grade. On this account, we fear the Yankee picking machines will never answer.

The next important step in helping to develop the fruit industry is *proper methods of grading and packing.*

There is a common notion that apples should lie heating in heaps for some days before packing, but this is a mistake, for in this way they are made to ripen too fast. They should be packed as soon as picked and hurried away at once to some cold store-house, if the best results are to be expected, so that their first crispness may be retained. My plan this season was to take my packing table out to the orchard and on it the pickers emptied their baskets as they picked, and the apples were at once packed and teamed away. In this way, one man, with a little assistance, will sort and pack for five or six pickers, and several gangs may be sent out if necessary. The ordinary first grade stock should go in barrels, and fancy apples in smaller packages, as the half barrel or the apple case. This fancy stock is picked off the packing table and sent to the packing house where women are employed to wrap in thin manilla paper and pack for a special trade. Now, if this class of apples could be stored in cold storage warehouses safely and exported just when each variety is most wanted, at the best prices, a great step would be taken toward developing the fruit industry of Canada.

Really the most deplorable ignorance exists in this *work of grading apples*, or else the utmost carelessness. "Canadian" stamped upon them is an important aid in selling many of our goods in Europe, but, unless the contents of the package is creditable, no

such stamp should appear. It is astonishing the mixtures that are sent forward as No. 1 apples. Large and small mixed together, wormy, knotty, scabbed, all in one package and sold as No. 1 grade. Sometimes even these are faced up with real fancy apples and sold accordingly to the great after-disgust of the buyers. We noticed in a Toronto paper this statement: "Dealers buy and pack the barrels themselves, so that the old country market shall not be destroyed through the offering of inferior fruit." We question whether dealers are more reliable packers than the growers. We know of some who constantly practise facing up with an entirely different grade of apple from the contents; and we know of plenty of growers who pack honestly.

But ideal packing has, as yet, been scarcely thought of in Ontario. We need to take some lessons from our California friends with whom packing is a business, and who do not hesitate to pay packing companies a certain price per package for grading and wrapping their fruit ready for distant shipment. Mr. R. J. Shepherd, of Montreal, has done something in this line with his Cochrane case, and Mr. G. E. Fisher, of Freeman, with his graded apples, but the mass of Canadian fruit growers have not begun to consider the importance of grading. Large and small apples should never go in the same package. Indeed small apples ought not to be shipped at all.

The same may be said of pears. They should always be turned out on a packing table, and the large and small sizes separated from each other. The French people put up Duchess pears in cases containing from forty to forty-eight, and these sell in Leeds, England, at from $1 to $1.25 per case. Of course, each sample is wrapped in manilla or tissue paper, and some packing material is used to keep the fruit from moving about in the case.

We tried separating our peaches in this manner last season, putting the large ones of uniform size in special six quart baskets made for our special use. Thirty-six filled the basket, and in the case of the very largest, half that number. The second size was packed in twelve-quart baskets. We noted the result, and found that the half-basket of No. 1 sold for exactly the same price as the large basket of No. 2.

Then transportation and cold storage facilities are needed to encourage and develop our fruit industry. I shall not say much upon these topics, because other gentlemen are present who have thought further along this line than I have done. I simply wish to draw your attention to the fact that California peaches and pears have this season been put through all the way to England, nearly 5,000 miles, and have arrived in excellent condition, and that at very low rates.

If we could have increased facilities, we could often save ourselves from disaster in years of plenty by sending our surplus pears, peaches, grapes and tomatoes to England. Our fine Red Astrachan and Duchess apples also could go forward and bring us excellent returns. And not only to England, but to much more distant countries. A neighbor of mine is trying the exporting of Canadian apples to South America, with some encouragement. I am assured that New Zealand would pay a high price for our Canadian apples, and I know from my own experience in 1895 that Australia wants Canadian apples in their spring months of October, November and December, and would pay from three to four dollars per bushel for such showy varieties as our Cranberry Pippin, providing we had some means of conveying them in cold storage chambers through the tropics. My shipment in 1895 failed on this account. I would have tried again in 1896 had I assurance of proper cold storage, but this I did not have. On the 24th ult. I received the following letter from Mr. J. S. Larke, Dominion agent at Sydney, New South Wales: "The Canadian-Australian steamers are equipped with excellent cold chambers, which they can maintain at any temperature. It is essential that the quantity shipped should be sufficient to pay for refrigerating a chamber. I fear the overland charges will be too great for the shipment of fruit from Ontario, save in exceptional seasons, but I look to its being a regular business from British Columbia in the future. The next steamer is bringing, I understand, fifteen tons of onions from Vancouver. These vegetables are worth $60 to $65 per ton here just now, and accordingly there is a fine profit in producing them in B.C. at such prices. Potatoes could be shipped here just now likewise. On the other hand there will be times when they will go the other way, It will be a mutual

exchange to the advantage of both, inasmuch as it will improve the prices just when the British Columbia farmers will have an abundance to sell."

Perhaps we may get safe carriage to Sydney, via London, yet, on such terms as to make Sydney one of our apple markets.

Now is the time for us to give our best attention to the subject of cold storage, because the Minister of Agriculture for the Dominion is prepared to do anything in reason for our advantage along this line, providing we can formulate some sensible and practical scheme of operation. In proof of them, I have received the following letter from Mr. J. W. Robertson, dairy commissioner, Ottawa, and which you will see refers to another letter from an experienced fruit grower :—

"The plan proposed by the Minister of Agriculture to arrange for cold storage service for perishable food products from the producers in Canada to the consumers in Great Britain includes a desire and intention to do something towards providing necessary cold storage warehouses for the preservation of fruits.

"It is believed that the period of consumption and of profitable market demand might be extended for two or three weeks in the case of many of the perishable summer fruits, and that large fruits for consumption during the winter and spring months could be kept in better condition with less loss, in suitable warehouses than when stored in haphazard places, as if too often now the case.

"Do you think it probable that a number of fruit growers in several different districts would form themselves into joint stock companies, for the purpose of erecting and operating district cold storage warehouses for fruit? I think a building sufficient to hold 25 car-loads could be erected and equipped with the requisite mechanical refrigerating plant at a cost of between $5,000 and $6,000. The charges for the storage of the fruit, when the warehouses were at all largely used, would yield a revenue sufficient to pay the operating expenses and a fair interest on the investment.

"Would a guarantee by the Government of say 5 per cent on the cost of the cold storage warehouses for three years, in case they did not earn enough to pay 5 per cent. dividend, be a sufficient inducement?

"Do you think help by the Government can be given in any more effective way, so as to bring about the erection and operation of these warehouses? I shall be very glad to receive your opinions and suggestions on the matter; and, if you think it desirable, you might call for an expression of opinion from leading fruit-growers through the columns of "The Horticulturist."

You will also be interested in the opinion of one of our leading fruit growers and shippers in southern Ontario. I wrote Mr. E. D. Smith, Winona, placing the matter before him and asking his opinion, and have received the following reply:

"Your esteemed favor to hand asking if the Government should further a scheme for the transportation of fruit in cold storage to Britain, would a stock company, with a capital of $5,000 or $6,000 be likely to be formed at Winona, if guaranteed interest at 5 per cent. for three years. I scarcely think so until the success of placing our perishable fruits on the English market has been more fully tested. My idea is this, if suitable storage warehouses were erected in Hamilton, and possibly another at St. Catharines and tests made for two or three years to see if the British market will take our fruits at profitable prices, whether they can be landed there in sound condition by this system, then, if successful, there will be no difficulty in having storerooms built at Winona, and, I fancy, almost every station along the line, if necessary, but for purposes of experiment, it seems to me that the fresh fruit could be loaded directly into the cars at the stations. It seems to me that the essential point is to get proper dry cold storage between here and Montreal and between Montreal and the port of debarkation and again immediately it is landed there with as quick change as possible from cars to boat and from boat to storage house. Growers would not care to put money into anything of that nature when a test could be made without this money being put in. I have every faith that we can grow in this Province of Ontario thousands of barrels of Bartlett pears, Anjou pears, and, I believe, Clapp's Favorite pears, and put them on the British market with cold storage and get handsome returns, but the system must be perfect. There would be no trouble in putting it on the cars in perfect condition. As for grapes, all they require is cool, ventilated chambers, perfectly dry, with a temperature of about 40 degrees, although I am satisfied that they will carry perfectly in a temperature of about 50 or 60 degrees, if there is a good circulation of pure air, and I still have faith that, if persisted in, our black Roger grapes especially will find a good market in Britain, and these varieties can be grown almost, if not quite, as readily as any other sorts. I see no reason why, with proper cold storage, too, our peaches could not be landed there and compete with California peaches. Trusting something may come of this scheme, I am, yours truly, E. D. SMITH."

One more important means of developing the fruit industry to be brought before us by gentlemen present, and that is the establishment of a fruit depot in London, England, for the sale of high-grade Canadian fruit. This should be inspected by a Government Inspector, and duly branded "Grade 1," with an object of creating confidence in Canadian apples and other fruits. I shall not trespass upon the important theme, but leave it for others more experienced to bring it before the meeting in an intelligible and practical manner. Hoping these hints may lead to some results favorable to the development of one of the most important of Canadian industries, I will close this rambling paper.

THE PRESIDENT: Now you have heard read these two important papers and I hope that we shall have a discussion on them that will bring out points of interest to the

Hon. Mr. Fisher, Minister of Agriculture, who is present, that he may see the wants of the fruit growers regarding the shipment of fruit to the old country. Certainly one of the most important points that we have now under consideration is the placing of our fruit in a perfect condition on the British market, which is practically unlimited.

Mr. W. E Fisher: I would like to ask the writer of that paper if he has had any experience of wrapping apples in paper and shipping them to the old country. I did that and received very little encouragement. The best that we obtained for apples beyond what we obtained for them without paper was from 3d to 6d for 50 lb. boxes. They wrote me that was the best they could possibly do, and that won't pay us.

The Secretary: Certainly that would not pay, because it is worth 3c. a box to do the wrapping, and the paper I suppose would cost as much more; but all that I have shipped have been wrapped. I shipped 500 cases last year and the same this year wrapped, and I put in about a dozen this year unwrapped just to compare notes.

Mr. W. E. Fisher: What does it cost to put this California fruit on the British market?

The Secretary: I cannot give you what it costs, but they get very low rates, probably very nearly as low as we do.

Mr. Huggard: I do not think it is of much importance that we should wrap our fruit in tissue paper to get it to England, in fact I feel rather opposed to it on account of certain changes that take place in the atmosphere during the voyage across; but if we had cold storage, that is, an even temperature to retain the air during the voyage across the Atlantic, our goods packed in our ordinary barrels, or perhaps in barrels made a little better, they could be laid down in the European markets just as perfectly as they leave the Canadian shores. I have had some little experience in that line. I sent some down to Florida by rail on two different occasions to a relative, and they arrived there in just as good condition as he ever saw them here, no damage whatever. On one occasion they were some four weeks on the road. I am satisfied that if our transportation companies were to reduce their rates a little, perhaps put on fast steamers and give us cold storage, that we could place our goods to compete with any nation in the world, in the European markets, and get better returns than we have been receiving for our crops heretofore.

The Secretary: The advantage of wrapping is that if there is one spot of decay that might be in contact with another apple, the wrapping would save that contagion.

Mr. Daly: What is the Secretary's experience as to the prevention of wounds, bruises, etc., in the handling? Does the wrapping protect them in the handling better than those unwrapped?

The Secretary: I don't know that it would very much. The great point is to get them snug so that they won't move in the cases. I presume that could be accomplished without wrapping.

Mr. Caston: There must be a good deal in the temperature while they are on the Atlantic steamers. If the Australians can bring them through the tropics, a much greater distance, and land them in the old country, surely we ought to be able to do it. Where does the difference lie? We came across a steamship agent coming on the train, and he said the steamship companies were altogether independent of the apple trade this year. Is there sufficient competition? If there is, they will compete for this trade. Then another admission he made to us was, that if there was a great rush of freight, they were in the habit of putting it down in the hold, and placing it near the engine and boiler, where it was very warm. There must be something radically wrong with the placing of the fruit on the way across the Atlantic. Fruit that is grown in a dry climate will certainly travel better than in a moist country like ours. The blame is generally laid on the packer, but surely it is not all owing to bad packing, and what we want to get at, is how to remedy the evil in the best way.

Mr. WARTMAN: Two years ago I was on a steamer on which I had 3,400 barrels of apples, and I was very anxious to see them unloaded down into the steamer. I saw several picking up apples and throwing them into salt sacks, and where the salt sacks went I could not say, but they could not get them back in the barrels again because we put them in so tight. When they burst open and run all over the decks they throw them into salt sacks.

Mr. DEMPSEY: I have not had as great experience in shipping probably as Mr. Woolverton. I have been successful so far; whether it was successful packing or what, I do not know. They have turned out well. During last winter the largest number of slacks was about 5 barrels to the car.

The PRESIDENT: Probably you could throw out some suggestion as to the way in which you pack.

Mr. DEMPSEY: I think I pack about the same as Mr. Woolverton, only I do not pack and ship in the fall. My packing is nearly all done in barrels, and I ship the whole winter through to March, with the exception of December and January.

The SECRETARY: You store your apples and ship them through the winter as the different varieties are wanted?

Mr. DEMPSEY: Yes, I ship all the early fruit off before December, and the other fruit I hold till after the holidays and ship it the last of March, and the last of March shipment has always been the best.

The SECRETARY: At what temperature do you keep your apples?

Mr. DEMPSEY: I try to hold them at 26° to 30°.

Mr. JONES: How do you hold the temperature down in the fall?

Mr. DEMPSEY: I cannot till the frost comes.

The SECRETARY: Would it be any advantage to you if you could put them in cold storage in the fall?

Mr. DEMPSEY: Judging from the way the Spys kept during the past winter I could not say it would make any difference had they been in cold storage in October.

The SECRETARY: In what order do you ship your apples?

Mr. DEMPSEY: The last I shipped was Ben Davis. The first variety was Wealthy. I shipped them the 20th of September; then the last of September I shipped Snows, making about three shipments of Snows, and then Kings.

W. E. FISHER: I would like to know what it costs to store fruit in cold storage in cities in the old country, because if we can get cold storage there at a low rate, I think it will be better to ship our fruit promptly, put it in cold storage and hold it there for a late market, than hold it here and ship it after the new year; it would carry better.

The PRESIDENT: We were to have had a paper from the Honourable Mr. Sanford, of Hamilton, on establishing a Canadian Food Depot in London, England, and Mr. Jones, of Toronto, was to have given us a paper on storage, but neither of the gentlemen is present.

Mr. BOULTER: I have always taken exception to growers packing their apples and then complaining of the results. My experience is that a man can pack apples for his neighbor first rate, but as soon as he begins to pack his own crop, they never turn out well. Let a man put his name on every package of goods that he packs, and if a customer buys one poor article it is his fault if he buys a second. We have a law that if a man puts up canned goods and does not put on his name, he is liable to $2 fine for every can without his name, and the retailer is liable to $2 fine by the poor consumer that gets hold of him. I believe that the unfortunate prices of fruit to-day result from careless packing. I would like to see a fast steamship freight service. There are more cold storage houses in Ontario than there were ten years ago. In our county, Prince Edward, the amount of apples being stored and shipped by refrigerator cars in winter time is wonderful. I doubt

if you could succeed with cold storage in England. Keep the apples here until the better market is obtained in England. Last year I shipped 700 barrels to Prince Edward Island. I said to the largest wholesaler in Charlottetown: "You can get all the apples you wish from Annapolis Valley; they grow the finest Gravensteins in the world." He said, "Yes, but no apples are like the Ontario Spys and Baldwins, and other fine varieties, and they always command a better price, but I want you to put all the big ones by themselves, and if you send small ones, put the small ones by themselves." (Laughter.) The finest apples to-day that this world produces can be grown in Ontario. (Hear, hear and applause.) We, who are shippers, know that Ontario apples bring better prices when they are right, than any other apples grown on this continent; and I would like to see our apple industry fostered and looked after, and shippers impressed with the necessity of putting up only first-class goods.

Mr. Dempsey, Picton: I am sorry that Mr. Boulter has found so many poor farmers down in his section. In our section it is quite different. Some farmers were indnced by a prominent apple shipper to have his men put up the apples and they would pay 25 cents a barrel for the putting up. One neighbor had his done up, some 26 barrels, by these packers and he got 29 cents. Another neighbor that I have a little influence over, put up his own apples and shipped them through on the same boat to England and he got $1.10. (Laughter.) A shipper in our own vicinity was telling me the other night that he sent west and bought a lot of apples and he sent his own packers up there to pack them and he bought a lot of apples packed by farmers in our section and the men who examined them in Montreal rejected those put up by his own packers and took those the farmer packed and sent them on. (Laughter and applause.)

Mr. M. Peitit, Winona: I cannot agree with Mr. Boulter that the fault lies with the packer. Dozens of barrels of the choicest apples have this year been packed in the most careful and systematic way and sent to the old country that have scarcely paid expenses. I believe the fault lies in the way they are stored on ship or at the other end. I don't believe the grower is to blame for poor prices that are very frequently got over there.

ADDRESS BY THE DOMINION MINISTER OF AGRICULTURE.

Hon. Mr. Fisher, who was received with applause, said: I am a farmer, it is true, and I grow some fruit for my own use, but I can't pretend for a moment to compare with those whom I am addressing in regard to the knowledge of fruit growing either in the growing of it or in the packing or marketing of it. Therefore it is rather hard for me to get up and undertake to say anything to this audience. However I have the courage which is inspired in me from the fact that I have not come here in any sense to teach you anything, but to try and learn something from you.

In my position as Dominion Minister of Agriculture, the onus has been thrown upon me to provide something in the nature of cold storage which is going to facilitate the export and the carriage of our perishable fruit products from Canada to the English market, and it is of the utmost importance to me that I should get all the information I can in regard to the trade in those products. Apart from the pleasure of meeting the men who have made Ontario fruit what it is and have earned for it the reputation it has the world over, I have come here simply and solely to try and find how I could facilitate and aid your trade and your business. (Applause.) This fruit business is of a peculiar nature, I think a good deal different in many ways from the dairy products, and the sale of those in the home market, with which I am most familiar; and in regard to fruit I find some little difficulties which I wish to learn from you how to overcome The other day in Nova Scotia I attended a meeting of fruit growers of what is here known as the Annapolis Valley—a name which has been extended to apply to the whole region extending fifty or sixty miles from the Basin of Minas to the Anna-

polis Basin; but in Wolfville and Kentville we are taken to task for using the term "Annapolis Valley" by the people who live in that section, which should be known as the Cornwallis Valley. I find the same difficulties among the producers of fruit in the Annapolis Valley and the Cornwallis Valley that I find among you. I was asked to provide cold storage for them so that they might be able to place their apples especially in the English market to advantage. I asked them, as I am asking you, what I could best do to reach that end. The answer there was, in the first place, provide a warehouse in Halifax—the shipping point for the large proportion of their apples—where they could store them until the market was fit to ship to, and secondly, to provide cold storage accommodation on the vessels from Halifax to the English market. They seem to think, as my own information led me to think, that in England to-day there is a considerable amount of cold storage accommodation, perhaps sufficient for the purpose of our trading there. That is to say, that if our apples or other perishable products can reach the English shores in the proper condition there would be no great difficulty there in finding the accommodation to keep them and maintain them until such time as the market is ready to take them. The difficulties that now meet you and the Nova Scotia fruit growers are probably about the same. They find in the first place that the railroad trains from even their short distance from the sea rather hurt the fruit. In a hot autumn day the fruit is heated, and they find again that in the ships as they go across the Atlantic at the present time the fruit heats, and it is not an unfrequent thing for them to find that when the hold if opened where there are a large number of apples the steam will rush up just as though the whole place below was full of steam. This is a thing which I think shows one of two things. My impression is that the fruit down there is too quickly put into the barrels. I am told that it is there a practice to take the apples right off the trees and put them straight into the barrels and ship them of to the sea as quickly as possible, and it looks as though these same apples steamed and sweated and heated in the hold of the vessels, and created this heat which injured them. You gentlemen who are fruit growers can tell me if I am correct in that idea or not. Then again, with the cold storage provided for these apples the question arises whether in a tight barrel for a short time all the cold of the cold-storage chambers will penetrate into the centre of that barrel sufficiently completely to keep the apples in proper condition, if they are put into cold storage in the kind of package which they are in the habit of packing their products. I have been warned by those who have dealt with this matter down there that the probability is that for cold storage purposes a change will have to be made in the package, and that the tight flour barrel, or apple barrel of the present day will have to be supplanted by something of a more open character, and perhaps smaller inside so as to make sure that the cold atmosphere in which the fruit is placed will penetrate quickly and evenly to the whole of the fruit contained in the packages. Here in Ontario you have a much larger railroad journey to the sea whether you ship from the port of Montreal or the port of Quebec or from St. John or Halifax according to the season. It will therefore be necessary that you should have refrigerator cars in which to send fruit from here to the sea-board, and I might say that I propose and expect next season to be able to arrange for a complete system of refrigerator cars which would go over the whole lines of the country, carrying our perishable food products as may be required to the centres where they may be kept in cold storage. (Applause.) I can understand quite well that this is a pretty large undertaking, and if at any one period in our season there should have to be moved several hundred thousand barrels of apples, it would be practically impossible that they should all be moved immediately after they are packed to the great centres; and therefore I want to ask whether it would be wise or best, or whether it would be necessary in the interests of the trade, that you should have cold storage warehouses in the great fruit centres as well as in the great shipping centres —when I say shipping centres I mean the parts where the goods would be transferred from the railroads to the ships to be carried across the ocean. That is one of the questions upon which I want your opinion and your views—whether it will be necessary in the great fruit growing centres to have cold storage warehouses where the fruit can be kept until such time as it will be possible or advisable to ship to the shipping ports. Another point on which I wish your suggestions is as to what extent these cold storage warehouses

will be required in the fruit growing centres ; what would be the likely amount of fruit to be exported in cold storage, that is to say, what the demands of the fruit growers of Ontario will be upon the cold storage that it is proposed to create ; and next I want to ask you about what length of time and what period of the year will be the greatest demand for this cold storage on the part of the fruit growers of Ontario. I may say that in my proposed arrangements in regard to cold storage the dairy interests require a large quantity of space during the latter part of the summer and winter. Will that be the time during which you too will be asking for space? During the early part of the summer they will require comparatively little cold storage, because it has been found by several years' experience that the time when the price of butter especially in England tempts our people to ship to England is about July and from that on. Our poultry at the same time will in a general way be exported towards the fall of the year or in the early winter. The egg trade will probably go through the whole of the year more or less. I can understand, of course, that your large trade in apples is the great export of Canada in fruit, and if you attempt to export peaches or any of the larger fruits or grapes all these must be necessarily in the fall of the year ; but I would like to ask you to give me some idea as to how long during the year after your fruit is ripe you will be able to extend this export so as not to require too great an accommodation at one time of the year and none at all at another. I ask you to give me your views as much as you can on this present occasion, or to send to me later on your information and knowledge. Something was said a few minutes ago with regard to the glut of fruit and the fact that the steamers did not care whether they had apples this fall or not. The fact is that the fruit conditions on the St. Lawrence this year were very peculiar. In the early part of the season you could have abundant space for all you wanted, but just about the end of the season there was a great out-rush of our products, and though the ship owners raised the price of fruit they still had the whole thing in their hands, the call for freight was so great. It has been years and years since that condition has existed before, and it will be years before it will happen again, because the high rates of freight will tempt a larger number of vessels than before to come to the St. Lawrence, and the result will be a lower rate of freight than existed in Montreal this year. It was a mere temporary condition of affairs and one not likely easily or equally again. A remark was made as to refrigerator cars in winter and the shipment of freight in winter in refrigerator cars. This brings me to a point on which also I wish information—whether you will want refrigerator cars and refrigerator accomomodation during the cold weather? The general impression has been that the refrigerator accommodation for our traffic would only be required during the short summer months, and that when the cold weather comes in, in the fall, they would be no longer needed. My own belief is that when cold storage is once adopted and the people begin to avail themselves of it and take advantage of it, it will be required even during the cold weather, because the uniformity and even temperature without danger of frosts as well as without danger of extreme heat will be wanted for those perishable products, and that after a few years, if not immediately, cold storage will be asked for even in the winter season. I regret extremely that in the course of the discussion there was not more information elicited, that there was not more of what almost was diversity of opinion, because then you know a good argument will arise and we will be able to find out the exact truth of the matter from different points of view. I want before sitting down to so express my extreme pleasure at being here to meet the fruit growers of Ontario. I find a number of gentlemen whom I have had the privilege of meeting before on various occasions. I am glad to meet them again, and I trust that in the course of this meeting we will have a very thorough discussion of these matters and an abundance of information given me. It is my first visit to Kingston or to this neighborhood. In my former experience I have been about a little in the different parts of the country, but my wanderings have not brought me to this city. I am sure that the occasion of this meeting is a very opportune one to me. It is especially interesting to me in my capacity as Minister of Agriculture, charged with the interests in which I pride myself I am interested, that industry which is my own industry and my own business (Applause.) It is also an extreme source of gratification to me to meet with the men who are engaged in fruit growing in the Province of Ontario. I think without

flattery I may say that fruit and its kindred employments is one of those industries which is not only of the utmost importance to the country, but it is one which develops about the best qualities in the individuals who are interested and engaged in it. (Hear, hear, and applause.) Wherever I have gone and mixed with the people, wherever I have come into a neighborhood where fruit growing is largely engaged in, I found men and women of the highest culture, whose tastes are always in the direction of the highest ambitions and the highest ideals of cultured people, and for this reason if for no other I am extremely glad to meet the fruit growers of Ontario. We of the Province of Quebec look to you as having done much more and gone much farther than we have in this industry, partly because of your better climate, and in some places the richer soil and suitable conditions—partly because, I am fain to think, you people of Ontario are energetic, active, intelligent, and that whatever you take hold of you seem to be able to succeed in, in the most marvellous way. I do not say this from any flattery; I say this because, as one coming from a neighboring Province, as one who is to-day not only belonging to that Province and presiding over the interests of agriculture in that Province, but who has charge of the interests of agriculture for the whole Dominion, I am glad indeed to meet with the people over the whole country who have not had opportunities of meeting with before, but whom during the time I occupy the position I at present have I hope to have many opportunities of meeting with and discussing their interests and my interests and obtaining that assistance by which only I shall be able to assist that industry and push on that industry in which we are all concerned. (Applause)

The PRESIDENT: I am sure that we are very thankful to the Hon. the Minister of Agriculture for the practical address with which he has just favored us. He has brought out points that I hope will now enable us to take up this question and discuss it in a proper manner. He has given you the invitation to do so, and it will be your own fault if you do not lay before the Minister the wants of your calling at the present time. In addition to that I think that the matter is of such importance that this society will be justified in appointing a committee who shall go into the matter thoroughly and lay before the Hon. Minister the information which he has asked for in his address, and for that purpose I will now appoint a committee to be composed of the Secretary, Mr. Orr, Mr. Fisher, and Mr. A. H. Pettit, and will ask this committee to present in writing to the Hon. Mr. Fisher at the earliest possible moment a full and complete statement of the case which will give him all the information that is desired. I should be very pleased indeed to hear any gentleman now who could give any information that will be of interest or benefit to the Minister.

Prof. SAUNDERS: I wish to say a few words on this subject of cold storage of fruit, because I apprehend there will be many difficulties in carrying out this project successfully in all classes of fruit. There is no doubt in the minds of any that have paid any attention to the question of cold storage, that cold storage is one of the most important measures that can be adopted at this time for the preservation of those perishable fruit products of which we produce so largely in Canada, and it is well at the outset to look the difficulties well in the face so that we may provide against what otherwise might result in disappointment. Experience is always of great advantage in all these things, and the experience we have had in the preservation of Canadian fruits it might be well to bring under notice. The first experience we had was at the time of the Indian and Colonial exhibition, and as I had charge of the shipment of fruits at that time I am conversant with the particulars. Cold storage apartments were built up in one or two steamers then running from Montreal to London, and a large collection of fruits was brought together, largely by the help of the members of this Association—one of the finest collections of Canadian fruits that was ever made—and this was shipped to Montreal There was no storage accommodation in the cars at that time, but it was placed at once in this storage refrigerator which is built on the plan of the Hanrahan cold storage refrigerator, that is, with ice overhead and a large apartment where the chilled air could flow, and circulation also was provided for in the interior. The object there was simply to preserve the fruit long enough to take it across the ocean and exhibit it at the large exhibition that was to be held at that time in the halls of the Royal Horticul-

tural Society. That experiment was eminently successful, and some five or six thousand plates of Canadian fruit were displayed to the amazement of the English people, carried there in a very good condition. The next experimental test made was at the time of the Chicago Exposition. There we had to face the difficulty of preserving these fruits for six months. A very excellent collection was got together through the liberality and energy of the Provincial Government by the agents they appointed. Mr. Pettit and others brought together a large collection of Ontario fruits. A large collection was also made in Nova Scotia and the Maritime Provinces, and another in Quebec. These were nearly all packed in light packages and shipped to Chicago rather late in the season when there was not much danger of injury from exposure to heat, and placed at once in a large cold storage building there. We supposed that everything was all right, but about mid-winter I wrote to the cold storage people and asked them to examine the packages of fruit and endeavor to ascertain what condition they were in. They replied that they were in bad condition when the packages were opened, although they had been preserved in a uniform temperature. A large number of specimens were wholly or partly decayed, and the people who had charge of the storage work recommended that we have all the packages opened and have them repacked, rejecting that which was unsound and packing up only sound specimens. They further told us at that time that it was a mistake to put the fruit in tight packages; that if barrels had a number of holes bored in them, or if the fruit had been put in packages made with slats, that they might have been preserved better. They also objected to the wrapping of fruits—I believe it was wrapped mostly in pieces of newspaper. You know that the fruit wrapped in tissue paper by the California people and shipped in cold storage is kept very well, and I apprehend that the shipping that was objected to by the cold storage people in Chicago was more on account of the character of the paper, and if the fruit had been wrapped in tissue paper, which is very porous, there would have been the same rejection. We adopted their suggestion and repacked the fruit, and some of it came out in excellent condition in the spring and a proportion, especially the earlier ripened fruits, were found to have very few good sound specimens when they were taken out. I think this difficulty arises from the fact that chemical changes are going on in the early ripening of the fruits at the time they are put in the cold storage chamber, and here is where difficulty is likely to arise in connection with the preserving of fruit. In the preserving of dairy products any deterioration in that, at least from butter, begins from the outside, and the firments which arise in cheese are of that character which are easily controlled by the low temperature than the changes that occur in the ripening of apples and pears. There, when the change occurs the skin which is not easily permeated by the changes of temperature and this chemical change which is not very well understood, is accompanied by the evolution of heat, so that when the ripening period has arrived and changes begin in the apples we have a difficult state of things to control in cold storage; and my reasons for bringing this point before the Association is to urge upon them to endeavor to overcome this difficulty by having the fruit go into cold storage when it is firm and sufficiently unripe to be sure that these chemical changes have not already set in and considerably advanced. I think that these difficulties we had in connection with the Chicago Exposition arose from the fact that the changes were already occurring in those early ripening fruits before they were put into packages to put into cold storage, and these having started were not easily controlled by any temperature that could be brought to bear on them in a cold storage warehouse. It is well to look those difficulties in the face and endeavor to overcome them by proper action at the proper season. The Canadian climate no doubt is of great advantage to the Canadian people. We have in this section of the country a climate where apples and pears of the very highest quality can be produced, possessing flavor superior to the apples produced anywhere south of us, and which if we take the fullest advantage of and endeavor to get these to the consumer in the condition in which they leave the producer, if they can be so carried without deterioration, I am sure there is a great future for the fruit trade in Canada. In any remarks I have made I would not be understood as throwing any difficulties in the way of cold storage. We should, I think, in all these cases endeavor to gain what we can from the

experience of the past and thus add to the probabilities of successful management and great continued success in a great enterprise like this.

Prof. CRAIG: Since the Hon. Mr. Fisher spoke one of our largest shippers came into the room, and I would suggest that the name of Mr. E D. Smith be added to the committee. I think he could give a great deal of valuable information.

The PRESIDENT: I think so myself, and will add his name to the committee.

Prof SAUNDERS: Mr. Craig has carried on some experiments, and I thought that perhaps he would follow me and give the Association the benefit of the experiments that he tried last year in cold storage in Montreal, which was just along that line.

The PRESIDENT: We should be very glad indeed to hear from you on that line.

Prof. CRAIG: I think that the results of those experiments have already been given to the society, and they have been put in possession through the means of our annual report and through my own remarks at the last meeting at Woodstock. They are practically in line with the remarks already given by Dr. Saunders and simply emphasise the fact that if we would be successful in the preservation of our perishable fruits we must begin to put them into cold storage before any distraction or breaking down of the actions which the ferments preceding the process of ripening begets. The process of ripening, the process of maturing, is in reality a process of decay, and although at the beginning we may not recognize it as such, it goes on gradually from step to step from the time the apples is green till the time it is in a perfect state of maturity, and later on when it is past that step and has begun to decay. So that it is absolutely necessary that we should recognize this fact and this principle, and in storing fruit put it in a storage before any actions consequent upon the beginnings of ferment commence. In this connection I might say that I was very glad to know the day before yesterday in passing through Detroit on my way to the meeting if the Michigan Horticultural Society that Canadian fruit growers had already begun to take advantage of the cold storage system not only in Canada but on the other side. In visiting the large cold storage house of Webb Bros. in Detroit I found several hundred barrels of Canadian Snows in storage that were later on to be placed on the Chicago market. When I got to Grand Rapids, at the meeting I found still further evidence of the enterprise of Canadians, and the Michigan fruit growers are awakening to the fact the Canadian apples are forcing themselves on the American markets by reason of their better quality; and this just brings us back to the statement made by Dr. Saunders that we have a climate here that produces not only the finest pears but the finest apples in the world.

The SECRETARY: I believe if we could take advantage of cold storage warehouses for our pears, for instance, that it would be a great thing for the fruit growers of Ontario. During the last season and a year ago also I stored Bartlett pears both in Montreal and Toronto in cold storage warehouses. At that time they were selling at very low prices indeed. During this season, as you all know, Bartlett pears were down to twenty-five and thirty cents a basket, and there was nothing in them, and I took advantage of this warehouse, for I knew they would be kept at a low temperature, and I kept them for a month or six weeks until after the crop was harvested and the glut was stopped. Now you know there is no pear that will sell when you can get a Bartlett, and the price rose last year from seventy-five cents to one dollar a basket, so you will see it was a fine step in advance for me to take advantage of that opportunity of storing those pears. If the Canadian Bartlett could be kept almost indefinitely in cold storage warehouses it would find sale at all seasons of the year, and it would be the pear for dessert purposes. The same thing can be said with regard to our Canadian Snow apple—no other dessert apple would be wanted if we could keep that apple in perfect condition throughout the season. So I think there is a great argument in favor of the establishment of such institutions.

Mr. PATTISON: I would like to ask Mr. Secretary if he stored any baskets. I understood the baskets did not answer very well in cold storage.

The SECRETARY: I stored in baskets. I think the cold storage men objected because the baskets took so much room.

Prof. CRAIG: The baskets are not suitable for cold storage. They would be stored in the same space but the cold storage warehouse cannot be made rat-proof, and while these might not eat a great deal they damage a great deal, and I think the box package is capable of being packed easier and more safely.

Mr. FISHER: Professor Craig, do you find that while you have been able to preserve the appearance of fruit by cold storage you can hold the flavor?

Prof. CRAIG: In the case of apples and pears I did not find that there was very much loss of flavor. Of course there is always in stored fruits a certain loss of this fine aroma that we detect and so well appreciate when the fruit is just at its prime condition. You know it is Grindon, that fine old writer on English fruit, who says "There is just one hour when the peach is in its best condition. That hour passed, 'tis afternoon." In the case of stored fruits, it is frequently afternoon, although we may not recognize it when we eat them; but if we compare them with the same fruits in their highest quality when they are just ripe from the tree we will recognise it. In the matter of stone fruits there is a greater loss of flavor than in the case of apples and pears, particularly in peaches. Peaches after being stored for five weeks have a fair appearance, and on being cut do not show much discoloration, yet on being eaten there was a distinct and very observable difference in the flavor. Stone fruits sometimes show signs of decay from the stone; the decomposition sets in from the middle and works outward, like some of our pears do when they are ripening naturally.

Mr. FISHER: How long did those pears keep their flavor?

Prof. CRAIG: I put them on the market December 15th, they had been in cold storage since the first week in September.

Mr. FISHER: Did you ever keep Bartletts twelve months?

Prof. CRAIG: No, but I think they can be if you could be absolutely sure of your temperature and sure you could hold it just at the degree you wanted it.

Mr. FISHER: I have held the Pomme Grise twelve months. It was just as bright at the end of the year as when we put it into cold storage, but it had no flavor at all.

Prof. CRAIG: I tasted peaches yesterday in Detroit in the warehouse. Of course that is not very unusual as we may have some Smock peaches in ordinary warehouses. These were Crawfords. Their flavor was somewhat off, but they were good in appearance, and I think they were ahead of California peaches at any time.

Mr. ORR: Would not there be a decided advantage in putting fruit into cold storage at the point of production? After being carried they would be more or less bruised.

Prof. SAUNDERS: If they could be carried in refrigerator cars it seems to me that would be as good as placing them in cold storage warehouses at the point of production. What you want to do is to keep the temperature low and to ensure that the condition of the fruit, whatever it may be at the time when it goes into cold storage, will not deteriorate. That is, if it is possible to keep it from any further fermentation that it will not deteriorate until it reaches the consumer.

The PRESIDENT: Have you any experience, Mr. Smith?

Mr. E. D. SMITH: No, but one of the most important things in this connection is, how long will the pears keep after being taken out?

Prof. CRAIG: It depends on their condition when put in. If they are put in before they have reached full maturity and kept at low enough temperature I anticipate—and my own experience leads me to say this—they won't keep a shorter time than they would originally in natural conditions; but if they have ripened up to a certain point and then are put into cold storage and held there, they go down very rapidly after being taken out. With regard to the district cold storage warehouses I do not know that I am competent to say anything, but I may just throw out a suggestion, that it seems to me it would be of great advantage to growers if they could put their fruit in the district cold

storage warehouses, and from that point distribute it to the points that give them the best market prices at the time when they wish to sell it.

Mr. ORR: I picked certain varieties of grapes and put them away in a basket and they were good till May. I sent them to customers and they put them away in the same way as I had, and they did not keep till January. That is my reason for asking the question.

Hon. Mr. FISHER: Is that due to the journey?

Mr. ORR: I think so; I think it is due to the shaking on the stem and the pressing in the package.

Mr. DALY: I have been experimenting a little for the last five years on a small scale with a small refrigerator, keeping early apples, and plums and pears, and I have kept early apples such as the Transparent, Astrachan and such varieties for about six weeks, but after they strike the air and are removed from the refrigerator they are gone in twenty-four hours, and you must do away with them. I have found that, while they come out of the refrigerator perfectly sound apparently, the flavor is nearly or in some cases entirely gone. My experience with pears has been that they will not keep as long as an apple. The best apple that I have found to keep in storage is the Yellow Transparent, of the early varieties, but I think you must be cautious in handling your fruit after it comes out of the cold storage; it has got to be handled very quickly, because it will stand no air. After it has been in cold storage for any length of time the moment it strikes the warm air it will go down.

The PRESIDENT: This question arises at once: under what condition or how well matured should your fruit be when you put it in?

Mr. DALY: I have experimented in that case. I have picked it quite green and put them in quite green, and it made very little difference.

Prof. CRAIG: What temperature did you have?

Mr. DALY: Well, I don't know just on the rule of hand. I kept ice in it; I never let it get empty of ice for a moment.

Prof. CRAIG: But the ripening process had been going on all the time, the temperature was not low enough and the fruit was nearly ready to go down when you took it out of the storage.

Mr. DALY: Yes.

Mr. ROBERTSON: I had an opportunity of going through a cold storage under one of the arches of the Brooklyn bridge, the most perfect storage ever I was in. In the office they have the temperature of every room in the building, and I saw pears about the 1st of March in perfect order. Of course when they come out of the cold storage these men have two rooms and they just take a basket or two baskets every day or two. They spoil very rapidly after they come out of the cold storage. The fruit men take them out as they want them.

Mr. CASTON: In keeping apples in a pit I notice they will keep perfectly well as long as you do not open the pit, but just as soon as you expose them to the air they will go very quickly. We often lose sight of the fact that a great deal of the fruit is not picked at the right time. The fruit is like a man going up hill; you want to take the apple just before you come to the summit. If you take an apple too much on the green side, it is insipid, but there is just a certain point where it should be picked, before the ripening process is complete.

Mr. E. D. SMITH: Is not there a great difference in the methods of cold storage as to keeping the fruit after it comes out? Will an apple or any fruit keep in ice storage as well as one taken from a chemical cold storage warehouse?

Prof. CRAIG: I think you are quite right that it will not, but at the same time I do not think we have full information on that point. All storage authorities are now agreed upon the mechanical or chemical refrigeration; and that kind of mechanical refrigeration

which gives not the dry air but as dry air as is consistent with keeping fruit without shrinkage, is best. Every cold storage manager that I have talked with advocates the best kind of mechanical refrigerator, that which is called the direct expansion, and gives dry air which is frequently changed by a perfect system of circulation.

Mr. PATTISON: I would like to ask if it would not work differently having a system whereby fruits when taken out of the cold storage would be introduced into a room that while warmer than the cold storage room would be colder than the outside atmosphere, and there kept for some time, on the same principle as people recovering from illness are kept as convalescents for a period before they go into the full enjoyment of their health

Prof. CRAIG: I think Mr. Pattison has stated his case, and it does not need any further bolstering up on my part. Fruit growers have noticed that if they put unripe fruit into a cold atmosphere there is immediately condensation on the surface and a collection of moisture which induces decay on the part of the fruit; and when you bring it from the cold to a warm atmosphere the fruit being cold causes condensation, and if you can do it gradually so much the better so as to get rid of this condensation.

Mr. PETTIT: The Hon. Mr. Fisher put some questions that I thought he would like to hear discussed somewhat this afternoon. One was whether it would be desirable to build cold storage warehouses at the places of shipment? I think if the meeting would discuss them for a few minutes it would not be out of place. In my opinion the carrying of fruit to the Old Country, testing our ability to market there by shipping in cold storage, could be done without these buildings, by placing the fruit at once in refrigerator cars and shipping it from the neighborhood where it is grown.

Mr. CASTON: In regard to building these houses at the point of shipment, I think that should be left largely to private enterprise. If there is any cold storage it would require to be at the ports of shipment; that is if there is any delay to occur between the shipment and the loading on the steamer, or the grower decides to hold it for a better market. The great thing is in the passage across the Atlantic and on the train. If we can get cold storage in transportation I think the matter of cold storage in the country will be largely a matter of private enterprise and will regulate itself. It is while in transportation that the fruit gets damaged.

The PRESIDENT: It occurs to me that there should be cold storage at the points where the growing is done, so that the fruit may be held there and sent forward in refrigerator cars and then in refrigerator steamers at the proper time, just when the English market would justify it.

Hon. Mr. FISHER: How soon after the apples are picked would it be necessary to put them into the cold storage?

Prof. CRAIG: I should think they ought to go into cold storage almost immediately after coming from the orchard.

The SECRETARY: I should think it would depend very much upon the variety. If they were summer apples, such as the Astrachan and Duchess, it would, but with the winter apples there would not be any necessity of hurrying.

Mr. E. D. SMITH: I quite agree that there should be cold warehouses at the stations ultimately if it is found to be necessary. The growers would not think it worth while to expend money, and I do not think the Government would be justified in erecting warehouses until after one or two season's test. Then I think it would be essential to have warehouses at the various stations.

CHAIRMAN'S ADDRESS.

By Principal Grant, Queen's University, Kingston.

I have been asked to take the chair this evening, and I do so with great pleasure, because I am not only interested in your objects, but have listened yesterday and to-day with great pleasure to your discussions. I listened with very great pleasure yesterday afternoon to Prof. Short's address, in which he pointed out, in a way that I think was new to some of us, the connection of gardening with the development of civilization. I really began to think after listening to him that he has touched a genuine point, because I remember when I was in Scotland for years there was no class of men that seemed to me to combine so fully the advantages of industry and culture as the gardeners of that country, and I was very much struck with the remark that was made to me once in Scotland, that the gardeners were the only class that did not furnish any contributions to the criminal class of the country. (Laughter and applause.) It seemed that every other profession had contributed, some more and some less, but that the gardeners were marked with a white stone in that respect; and that is what we might expect when we remember that we are told at the very outset of Revelation that man was made in God's image, and further that for the development of man he placed him in a garden to dress it and keep it, indicating surely that in this way man's character would be most fully and beautifully developed to all its rightful issues; and that surely is the great object that we should look up to in dealing with this or any other question. It is surely a higher aim than even the more economical consideration, for sometimes we have at these discussions remarks made that seem to indicate that the country is to be judged by the amount of money that its people make. Now we know that men are not merely human bees or ants or beavers, but that they are the children of God, and that they are to be developed to all the rightful issues and to the very highest point of culture. We therefore feel that it is an object worthy the consideration of the statesman and the patriot and the true man, and so we are all interested in the work of your association. It is pleasing, therefore, to see that both the Dominion and the Provincial Governments recognize this, and that we have distinguished representatives of both Governments present at your meeting. (Applause.) I rejoice much in this, because I think it is the right course for Governments to take. I am pleased to think from what we have seen and heard that we have in the Hon. Mr. Fisher and the Hon. Mr. Dryden the right men in the right places. (Applause.) I think it is only right to say, however, that I believe that Mr. Fisher's predecessor was also a most suitable man for the position. He was not a farmer, and some people used to think, therefore, that he was not a good man for the position of Minister of Agriculture. I quite differ from that opinion. I think it is no more necessary to have a farmer in that position than it is to have a banker as Minister of Finance. What you need first of all is a man of good sense, and I have met even some farmers that were not blessed with that quality. (Laughter.) In fact it might even be said that it is a somewhat rare quality. You need a man, above everything else, with the power of judging men, so that he may get right officials, and then with that large common sense which, when he has obtained the right officials, will know how to trust them, to give them as free a hand as possible, this being a very big country, and it being quite impossible for a Minister to watch a man travelling over thousands of miles. And a man is needed who will know how to occupy the golden mean between paternalism on the one hand and *laissez faire* on the other. Governments are not for the purpose of superceding private enterprise; in fact Governments may stimulate certain departments of private enterprise too much; but it is their duty to discern the real basal capacities and industries of a country and then to afford opportunities for continuous scientific experimentation along the line of those basal industries, because that is the great war in which modern society is engaged, and therefore more required by governments now-a-days than even the departments of the army and the navy—a war against ignorance, a war

against those ceaseless pests and enemies that pray not only on our industries but upon our health. I saw only to-day in a newspaper the statement that the minute insects in the United States afflict the fruit crop to the extent of some three millions of dollars a year; and so there is perpetual need of scientific experimentation to detect these and fight against them; and there can be no discharge in this war, for as soon as one enemy has been vanquished another is sure to crop up. That gets an illustration from what we had in connection with the Dairy School in whose hall we are now met. Before the School was established the cheese of this district was far inferior to the other districts of Canada; but one of the highest dairying authorities stated that the school had raised the price of cheese in this district about half a cent a pound. I made a calculation and found that that meant $10,000 or $12,000 in one year; and as the Dairy School is managed at a cost of about $3,000, even in the very lowest consideration of the case there is a return of three or four hundred per cent. But there are more students from other counties than from this county; more students from all over eastern Ontario. They have sent out over one hundred men educated in the industry every year, taught habits of cleanliness and order, and these carry with them into their several localities those habits and are a benefit to the country in various other ways. And now that the institution is taken over by the Hon. Mr. Dryden, he does not mean to let it stop where it is. He will tell you that he intends to introduce great improvements and extensions; because it is quite clear we need in conjunction with it a chemical and bacteriological laboratory, and there is no place where you can have such at so cheap a rate as when you are in the neighborhood of a university, where, instead of having to pay a frofessor $1,500 you can get a tutor for one-tenth of the amount. It is a case in which you see the advantage to our common country of us all working together. It is quite clear that not only does Canada now raise very little more than enough wheat for her own consumption, but that any country that has virgin soil can raise wheat—the Hindoo ryot, the Russian moujik, the exile on the Pampas of Argentina, can raise wheat and sell it cheaper than we can; but these men cannot make good cheese nor good butter, nor raise the higher quality of Fameuse apples nor of Bartlett pears. A country is not measured in its greatness by its wealth; that is surely a most contemptible standard to judge any country by. The wealthiest countries of antiquity contributed nothing to the greatness of humanity; but little Athens, little Judea, what have they done? They have been the schoolmasters of the race—the one to the brain, the other to the heart and soul. And so we look not merely at the amount of wealth, but at the kind of men that the country is to produce, and the kind of men are determined chiefly by the industries in which they engage. It is no wonder, therefore, that we are all interested in your work.

ADDRESS BY HON. JOHN DRYDEN.

I am very glad to be permitted to meet the prominent fruit growers of this Province in convention assembled, and to bring you the greetings of the Government which I have the honor to represent here. I have not come to undertake to instruct the men whom I see before me in the proper methods for bringing about the superior production of fruit of any kind growing in this country. It would never do for me to undertake to teach experts in this business, men who have for many years been giving their time and thought to this particular question, but I am here rather, to use a scriptural phrase, to stir up their pure minds by way of remembrance; and if my presence here will add anything of inspiration or enthusiasm to their work I am sure I will be very glad indeed. I ask the members of this Association to remember that they represent one of the greatest and most important industries of this Province, an industry which, if you will allow me to say it, is just in its infancy. It has made considerable progress, as you men know, but I venture to say that few of us realize what is before this industry in this Province of Ontario. (Hear, hear). I ask you to remember also that whether this industry shall be developed along right lines depends very much upon the efforts which will be put forth by this Fruit Growers' Association, and the future success will depend very largely upon

the foundations which will be laid now. I ask you also to remember that the efforts which you are now putting forth do not touch merely the present, but must inevitably reach forward far into the future. I shall never forget a remark made by an old man reaching nearly seventy years who was rebuked for planting a new orchard and asked what he expected at his time of life to reap from it. His answer was, "Well, if those that come after me will take as much pleasure and satisfaction in partaking of the fruit of these trees as I do in planting them I will be well satisfied." (Applause.) So I think the members of this Association should be stimulated in their work when they remember it is not merely for the present, but reaches far into the future, and that the next generation will receive benefit and blessing because of the work which is being done now.

When we remember all these things, and that the eyes of all the people of this Province are upon this Association—the people who furnish the aid to help to carry on the work in which you are engaged—and think of all the possibilities of this great industry, it is no wonder that we see in connection with this Association new life, new energy, new enthusiasm and new enterprises being manifested year after year. I am very glad that it is so, because it is undoubtedly true that there is very great danger, in all these organizations which depend largely upon public aid, that individual effort will be dwarfed on account of having a guaranteed income: but I wish to point out that the public aid to these organizations is given rather in order that we may by doing so stimulate and encourage the efforts of individual members of the Association to do better, greater and higher things than could be possibly accomplished without this aid. All the people are interested in the aid which is given to these various organizations, and it is given by those who are its guardians because they believe that all the people are directly or indirectly interested in the particular industry represented. The Legislature gives these grants cheerfully and willingly because they believe that spending it in this way will bring a better revenue and a greater return to all the people. If this is not accomplished there is no defence for the grant, which should then be curtailed or withheld altogether. The grants in recent years have been increased because those who had the authority to give them believed that thereby they would increase the revenue and the annual income of the people as a whole, and because they have faith in the future of this industry.

I do not know whether any of us fully comprehend what is to take place twenty-five years hence in connection with the fruit industry of the Province of Ontario. Commence if you will in the western end of the Province, on the fertile and rich soils of the newer counties of Essex and the sister county Kent, where they are able to astonish us by the production of the finest peaches and grapes as well as other fruits; go up along the shores of Lake Huron and around Georgian Bay and examine the quality of the fruits in all those districts; come across the country inland, taking in the old Niagara peninsula, about which everybody knows, and then come on down through, past the city of Toronto and along the shores of Lake Ontario until you get away into this eastern country, you have a territory with natural conditions adapted to produce a finer quality of fruit than you can find on any other piece of territory on this American continent. (Hear, hear.) There is no doubt of it. We have it here stated by gentlemen who ought to know better than I know—and I know myself what are the possibilities of superior production—but, as to the enormous quantities, we have territory enough and can produce quality sufficient to supply millions of people with the very finest of fruits when we have learned to produce them. Some of you gentlemen know perfectly well how to produce them; but my difficulty is that we have all over the country thousands and thousands of people undertaking to do what you are doing and failing in the attempt simply because they do not know how. It is to reach these people that this organization is brought together (hear, hear); it is to carry the instruction and information that you gentlemen possess; it is to carry the average of our product to a higher plane, that we give all these grants. Applause.)

If I read correctly the report of your meeting, some gentlemen connected with this Association are ready to stop and say we do not want any more develop-

ment of the fruit industry; we are producing too much already. (Laughter). Producing too much already? I am afraid that I will scarcely be able to assent to that proposition. I ask the gentlemen who have that view to remember that the year 1896 in the first place was a very exceptional year. The like of it perhaps none of us remember. Perhaps we have never had in other years such an extraordinary production in all parts of Canada, or at least in this Province; we have had an extraordinary production in all the fruit districts apparently of this North American continent, and it does not matter seemingly what particular variety of fruit—apples or pears or anything else—it seems that all along the line we have had a very abundant production; but with all this production, if we had been supplied with proper facilities to handle it, you would have found very little difficulty and you would not have had to exclaim "too much" at all. (Hear, hear.) But I am willing to admit, if you will, that we are producing too much of that which is inferior. (Hear, hear.) This is a pet theory of mine and I am always pounding at it, and I intend to so long as I have any power to pound at anything. This country does produce too much inferior fruits to-day. Many of our orchards were planted long years ago, when very little attention was paid to the variety of fruit, and the fruit that grows upon those orchards is altogether out of date and out of place. Those orchards were filled up, many of them, with soft and inferior apples that are not fit to ship across the ocean; yet the attempt is made to ship them. Unfortunately all of them have to be marketed at the same time, and what is more, they have to be consumed all within a short period and the result is that naturally when you undertake to do this you have at one season or another what you call a glut in the market; and the inferior stuff—I ask you to remember this—the inferior fruit always stands in the way of that which is superior. (Hear, hear.) Somehow or another you cannot push it aside and leave the other to take its place. There it is in your way all the time; and though you have that which is superior yet the price which you will get for it is affected because you have that which is inferior thrust upon the people at the same time. The same thing is true of our dairy products. What did I find years ago? How is it about butter? I found stacks of it, warehouses of it, car-loads of it, tub after tub, tier after tier, piled up, and when you asked the gentlemen, "What are you going to do?" he would reply, "What can we do with it? we can make nothing but waggon grease out of it." But yet it was butter, it was in the market, and it was standing in the way; and this always works in the reduction of price of that which is superior. So it may be, and I am willing to admit, that we are producing too much of that which is inferior, but we are not producing too much of that which is superior in this country. Did we not hear the Secretary of this Association reading the quotations? You and I have read them, and they sent across on the wires from the Old Land, "To much of that which is inferior; send us your superior apples, and there is plenty of room for those in the market, but we do not want any rubbish." And there it goes on from week to week, the same thing being stated; so then I say there is room for development of this industry along those lines, and as long as we are willing to undertake a better production we shall find room somewhere, because I believe in the theory of my good old Scotch friend who, when I suggested that the price of one of his animals was very high, and that he would not be able to sell it, replied "Aye, but it is a good one, and the man is born somewhere that is going to buy it!" (Laughter). So I believe that people are born somewhere that will consume that which is superior, but will refuse to take that which is inferior, though you offer it to them at a much less price. After all, will it not be the survival of the fittest? (Hear, hear). It is true that in this Canada of ours there are some portions of the country where you cannot satisfactorily produce fruit; there are other portions of it where we have admirable natural advantages for this purpose. Well, now, if I produce an inferior quality of plums I shall just have to stand out off the way for some of my friends up about Owen Sound or in that direction, and let them have the market. If I can only produce a quality of grape which is very inferior I shall be before long crowded out of the market, and I will have to quit it and produce something that I can produce to advantage. So many of the trees that are now declared useless will have to be dug up by the roots, as I am digging up some on my own farm that my

father took care of for many years. He did not know that they were useless when he was taking care of them, and he had to go over the orchard again and put in new grafts because he had been deceived in the sale of the trees, which were a different quality from what he had expected. I am digging them up by the roots, and propose that their place shall be taken by something superior such as you see on this table. That is what we shall have done all over this country, and then we shall find that our products will hold their place and occupy the front position wherever they are put upon the market.

I congratulate the fruit growers of this country and the members of this Association on the fact that we are coming to better days, because we find in recent years that the gentlemen who are placed in authority in the public positions in our country are beginning to understand that it is one of their duties and one of their ultimate functions to undertake to help those who are following industrial pursuits; and so we have listened to the discussion which you had here to-day and to the words of the Hon. Mr. Fisher when he addressed you, when he told you that he had undertaken to provide better transportation facilities, and that he has proposed that there shall be a better supervision over these perishable products en route to the best markets of the world. Now this is all needed —this assistance to the men who are thus producing these articles. It is certainly very discouraging to a man after he has spent a year's labor and skill and has produced a very fine article such as you see upon this table to find that it is destroyed on its way to market because of improper facilities being afforded. It is a very discouraging thing, and one that certainly ought not to exist if there is any way of providing a remedy. Unfortunately too many people in shipping their fruit have been simply providing freight for the railways and steamships; these have got all they ask out of it; but the poor fellows who have labored and toiled for the production of it have had nothing out of it yet; sometimes they have something to pay as a bonus to the steamships and railways that carried it for them. This is unfortunate. Sometimes it is their own mistakes. Perhaps they have not paid proper attention to the production in the first place. There are some of our farmers who belong, I am afraid, to that class who are not too much gifted with what you call common sense, who when you bring instruction right to their very doors and thrust it in upon them will refuse to take it, will refuse to believe there is anything in it. And there are portions of this country where it is absolutely necessary that those who produce the best fruit should pay attention to spraying their trees with the proper article and at the proper time; but they say, "Oh, my father never did this, why should I do this? this is a great deal of trouble and bother; if we can get the fruit without that I guess we will let it go!" And it is only when you hammer away, and give them line upon line and precept upon precept, and give them object lesson after object lesson that they will undertake this work. Now, it may be in some places where there has not been the proper return that they have not paid proper attention and there has not been proper handling and all that; but I venture to say that in a good many cases it has been because of improper handling by the employees of the various railway companies and steamship companies who handle those goods. (Hear, hear and applause.) And I would like to say in the presence of Hon. Mr. Fisher that I will not be satisfied unless he undertakes somehow to get at these people. I do not believe that the Allans, for instances, who control one of our prominent steamship lines, and I do not believe that the gentlemen who are controlling these railways corporations, really desire that their employees should undertake the destruction of our property; and yet that is what they do, like a man who takes a trunk off a train, as if he was determined to smash it if he could. Yet it is so, judging from what we have heard here this afternoon. I believe if the attention of those who control these railway and steamship companies were drawn to the matter they would insist upon their employees paying proper attention; and I will expect that the Hon. Mr. Fisher in dealing with these men will draw their attention to the fact that this property is really destroyed because it is put in an improper position and in an improper place in the ship in the first place, and because when it is dumped out with such force it is all smashed to pieces.

I want to reiterate what I suggested in my remarks before this Association a year ago. I think it is high time that we should undertake to teach the fruit growers themselves—and

I am saying this, knowing that there are some gentlemen within sound of my voice who will not perhaps agree with me—that it is their business to act independently from start to finish in the choice of their trees, independent in the planting and caring of them, and in the picking and packing of their fruit. Let these men be taught how it ought to be done. Let your system be of such a character that the work well done will be at a premium; let it be of such a character that the men who undertakes to deceive, who undertakes to fraudently pack his fruit and palm it off for what it is not, that suspicion will always rest upon him, and that it will be impossible without a good reputation in this regard that proper returns should be received by any of those men. I am as confident as that I am speaking to you just now that this is the correct principle. What do we find in many of our districts? We find farmers depending utterly and entirely on the dealers to pack their fruit; and what happens in the season when the dealers are anxious to buy? They buy a great deal more ordinarily than what they can properly handle within the time limited, and so it comes to pass that the fruit is picked, laid on the ground under the trees, the chickens run over it, the birds pick it, the rain comes, sometimes the snow, and covers it over, and still the packers are not there to put it away. What can you expect under the circumstances? I think that ought not to be, and I think that we should encourage those who grow the fruit to pack it, and if necessary do as Mr. Boulter does, put his name on it. If I packed fruit I should not be ashamed to say that I packed it; and if I did not do it correctly I ought to be told, and understand that I am going to suffer loss when I did not do it well. What I want is a premium on the work that s well done in this regard.

Then another thing: if there is one thing more than another we need in this country it is discrimination in the purchase of agricultural produce. What I mean by that is, let the quality tell the price. I remember perfectly well in my young days, when sent by my father to the market, when wheat was taken just at the same price, it did not make any difference what kind of wheat or how many times it had been run through the fanning mill. I remember when the great demand was made for barley in the early days that some men took barley from the thrasher without running through the mill at all; and when I insisted upon mine being cleaned the men said, Mr. So and So takes his just from the thrasher, he never looks at the bags. All that has been changed; and if you will undertake to obtain the first price you have got to have the first grade. That is good sound doctrine. I believe in it; and sometimes you and I as farmers fail to produce the first grade and we feel aggrieved by it; but we cannot complain if we get the price according to the grade we submit to the buyer. It is just the same in regard to our live stock products. Some of us know that a particular class of animal on the English market will bring considerably more per pound than another class, and when the drover comes around and asks what we want he says, "I cannot afford to pay you any more than I pay Mr. Jones, because he will be offended." "But won't you acknowledge that this animal is worth more than the other—that this animal will bring almost twice per pound than the other will?" "Yes, but I have to take them on the average, and I have to make up on one what I lose on the other." I would like to ask if that is fair to the producer? I would like to ask if you are going to encourage superior production? You are really encouraging inferior production; and we want to have men in this country independent enough to discriminate, and let us give a premium for that which is best. If we are to have any real progress, any really development in this industry, you must consent to put a premium upon quality. Some of you may remember that not very long ago, in speaking to another Association, I related an incident which occurred in the North-West, when the British Farm delegates were paying a visit to this country. One of them, a Welshman, whom I learned to know very well, gave me this himself. He was taking his dinner at one of the hotels in our North-West country, and he naturally asked for a piece of beefsteak. The poor man, as he told me, labored with this beefsteak and labored with it; he tried his knife on both sides, lest he had got the wrong side the first time; he took the piece of steak at all corners and all angles; he turned it over on the other side and tried it again, and utterly failed to get a piece off at all or to make any impression upon it. (Laughter.) In the dilemma he beckoned for the waiter. "I

would like to ask you whether you people in this western country grade your beef the same as you grade your wheat?" The waiter said, "Beg your pardon; I do not know what you mean." "Why, I mean just what I say. I want to know if you grade your beef in this country the same as you grade your wheat; because if you do I should grade this beef that you have brought me as Number One Hard." (Laughter.) Well, number one hard beef is not wanted anywhere; it will not sell anywhere. I would like to know how much beef the worthy chairman would take at a hotel if he had any experience of that kind. As he says, that is the kind of beef that lasts a very long time, and if the landlord can palm it off on those who visit his hotel it is all very well, but the ordinary man will not put up with that sort of thing. But I want to say that number one hard apples, such as we can grow in this Province of Ontario, will find their way, if you will give them a chance, into the place where you will find the very best markets. The best markets in the world demand quality. There are people in Great Britain and New York State who have got sufficient income to say, "Give me the best you have got; I don't mind the price, but I want the best," (hear, hear); and when he knows where he is to get the best he will have the means to find it. I was very glad, indeed, to hear Prof. Craig saying that the people of the United States had begun to realize that the little Province of Ontario—a frozen bleak region in Canada that some of those people talk so much about—was producing fruit that excelled in quality that which they prothemselves; and they will begin to study what kind of a wall they can put up to keep us out; but may I suggest, Mr. Chairman, that the wall won't keep it out if it is better? (hear, hear). We want more of that which is best and less of that which is worst. Let us keep this before us all the time, and you cannot keep the people from buying it. What we want in England is a better reputation. We have got a reputation for our cheese, and if I am permitted to do anything I am going to try and see if we cannot hold this reputation, for people are trying to get it away from us, and trying to get ahead of us. We have no reputation as yet for our butter, and we have no reputation in England for apples as we ought to have, because you load up the market with that which is inferior and which never ought to go. What we want is a system that will give a premium on quality, and that will help the man who produces to realize that only in this way will he find the best returns.

I believe that this country received one of the best advertisements that we could receive anywhere in the work that we did at the World's Fair at Chicago. (Hear, hear). The Province of Ontario spent a lot of money on that occasion, and there is no industry that has received greater benefit from what they spent there than the fruit industry. We exhibited our fruit in competition with the best fruit-growing States of the American Union, and the judgment of those who compared those fruits week after week and month after month was that ours was superior. But it is not enough thus to present it on the table. What we want to do is to see that we have a marketable commodity of that quality, and to show the people of Great Britain that we have any quantity of that same quality, and we want to keep it before them, and then there will be no doubt about the market we will have. Now what I am pleading for especially is that in all this I want the producer to get the benefit when he produces a quality that the market demands. There are some dealers here, and they will excuse me if I say I am not particularly interested in their welfare at all; they are perfectly able to look after themselves (laughter); but I do plead, and I am always pleading for the producer. That is the man after all who is really creating the wealth of this country, and he is the man who ought to receive the assistance now. I believe the man who has labored and toiled in the fields of our country is really adding to the wealth of our country, and the man who goes into the mine and into the forest—those are the people alone who are really making the additional wealth which our country has, and therefore these men ought to be aided and protected. The man who is bearing the burden and heat of the day and patiently receiving what Providence gives him, whether it is of storm or calm or heat or cold; who, when he has success is grateful and rejoices in it, but who, when he fails, pluckily tries it again, always going on with his work hoping for something better

in the future—these men who are at the very foundation of our prosperity, are the men who deserve our sympathy and who need and ought to receive our help. It is one of the legitimate functions of this Association to bring help to these men under these circumstances. There is a cry all over country for information for these men. Let the information be given freely and cheerfully and heartily, and even let it be given where it is not asked for, because the more information you can give and the more light you throw on this question, the less of that which is inferior will be presented on the market in competition with that which is superior, and so in that way we shall bring the greatest benefit to the greatest number of people in our country. I am aware that this work is very responsible and that the officers controlling this Association, if they rightly view it, will feel the responsibility which rests upon them; but is it not full of interest and encouragement and hope as well? The Government which I represent bids you God speed in this work. The country on the whole cheerfully pays the money that is required to aid you in this work; and I am sure there is no man listening to my voice, who has had to do with this work during these long years, who can look back and realize that they have had a hand in bringing about this development, without a feeling of intense pleasure and satisfaction. I congratulate you on the success which has resulted from your labors, and trust that this success will be in the future beyond even what it has been in the past. (Applause.)

ADDRESS BY HON. SYDNEY FISHER, MINISTER OF AGRICULTURE FOR THE DOMINION.

Hon. Mr. Fisher said he had not come expecting to speak this evening. He expressed great gratification at seeing such a large meeting, and said he felt it his duty to meet the people whose interests he was set to serve, so that he might the better perform his official duties in relation to them. He proceeded: You said, Mr. Chairman, a few minutes ago, something in regard to the position of Minister of Agriculture, and you implied that while it was not essential that the Minister of Agriculture should be a farmer, I do not think you undertook, at all events, to say that he should not be a farmer—(Hear, hear and laughter)—and I confess that I do not agree with you in your expressions that he should be anything but a farmer. (Hear, hear.) I confess, sir, that if to-day I am the Minister of Agriculture of the Dominion of Canada, it is because I am a farmer, because the chieftain and the leader of the Government of the day thought that it was due to the great farming interests of this country that one who had studied that business practically should have charge of those interests. (Hear, hear.) But taking a little broader view, after all, you would not suggest that anyone but a lawyer should be the Minister of Justice. (Hear, hear.) You would not suggest that anybody, perhaps, but a merchant, or somebody who has engaged in and understands trade, should be the Minister of Commerce or the Controller of Customs; and therefore I think it is but right that the Minister who is in charge of the great agricultural interests in this country should be one who is engaged in that business, and has, therefore, a better opportunity of understanding its wants. (Hear, hear and applause.) But in this respect I can take you a little nearer to your own home, because you have had the example and the experience in the great Province of Ontario of a practical Minister of Agriculture who is himself a farmer, and who has proved conclusively, I believe, to the whole people of this Province, and I believe to the people in the other parts of the Dominion, that a Minister of Agriculture ought to be a farmer, and that a farmer makes the best Minister of Agriculture possible. (Applause.)

Now, I have been asked to say a few words about cold storage, a subject to which the minds of the people of this country are looking largely for improvement and benefit to the great business of our food production in Canada, and I may not arrogate too much when I say that to-day the hope of our whole country is in the improved conditions by which the food of this country can be sent to those great markets in the European lands that wish that food and are willing to pay the price for it. To-day the exports from Canada of food products are the largest of any one export from our country.

If we can in any way bring about the fact that those products shall have a slightly better price in the home markets of England and the Empire, we will bring more money into the coffers of the great producing classes of this country, and in that way enrich every class of the community. This end may be brought about by arrangement of cold storage, by improvements in transport and in methods of handling our products. To-day those food products, even though placed in the English market at the low prices that they make there, are the dependence of our people; and any addition which we can make to those prices will be almost entirely and wholly an additional profit. From enquiries I have made, and from what I can find in regard to the matter, the actual cost of the cold storage arrangements which may be necessary to place our products in the English markets in good condition is very, very slight indeed, and that the additional charge on the transportation of our food produce would be so small as to be hardly measurable to each individual pound or package of freight or butter or cheese. The improvement will redound almost entirely to the profit of the producers of this country. I congratulate this Association on the noble work it has done, and I consider that to this and kindred associations, aided so generously by the Ontario Government, through grants and institutes and the work of trained specialists, is due the proud position Ontario occupies in the agriculture of this continent and the whole world. (Applause.) No better educational work has ever been done by the Government than has been done in the last few years by the Government of the Province of Ontario. But while that is in the sphere of the local authorities, there is a sphere and there is a way in which the Dominion authorities also can aid in the work of the development of our country, and I hope that in the future more than ever, the Dominion authorities and the local authorities can work hand in hand, so that the sphere of the one will not overlap and interfere with that of the other. It seems to me that it would be folly that what Mr. Dryden and his government have been and are doing so well should be attempted by the government at Ottawa or by myself. It seems to me that outside of the proper sphere of the local governments there is an abundance of scope and of work which the Dominion Government can do; and I can assure you that the present government is entirely desirous of doing that work to the utmost extent possible—(applause)—and that in my position as Minister of Agriculture I shall devote my whole time and attention to the furtherance of that work. This work, it seems to me, is especially that connected with the trade and the commerce, which under our constitution come naturally and properly within the sphere of the Dominion powers, and it is right and proper that the Dominion should try to assist in the commercial aspect of the questions of fruit growing, dairying, live stock and grain export. Two or three questions naturally come up. One in regard to freight rates has been spoken of. It is one that is especially in the sphere of the Dominion Government, and I can assure you that in the future this question will be dealt with as it should be, with the interests of the agriculturist and producer thoroughly and well considered. (Hear, hear.) There is another part of it, and that is connected with cold storage. I regret to say that in some instances people have got very, very large ideas in regard to this. I have had schemes put before me in regard to cold storage that would involve millions and millions of dollars. I have been asked to subvent and subsidize schemes which would involve such large sums as would handicap the government in its other work. It should be remembered that governments are not made to do the work of the people altogether; governments are made to do the work of governing the country, but it is the people themselves who should undertake to do the especial work of the country, and who should themselves undertake the responsibilities especially of trade and commerce. Competition is necessary, and when the government meddles more than is absolutely necessary I believe that it does harm rather than good. (Applause.) The fact that England stands to-day at the head, commercially, of the whole world is not due to anything her government has ever done; it is due to the enterprise of her citizens, and it is because they have been willing and able to go out into the whole world and fight their battles on their own merits and in the self-confidence of their own strength and their own vigor. I believe the same is true of Canada. I believe that we have to-day in Canada a population that are well able to manage their own affairs, well able to conduct

their own business ; and I think that the government should do as little as they can possibly do with to interfere with that business. But I fully appreciate and understand that there are experimental suggestions of certain new things in which it is proper and right that the property at large should bear the burden of the experiment, and that no private individual should be asked to run the risk of that experiment—(hear, hear)—and to that extent and in this way I feel it my duty as a minister of the Crown, as a minister and a servant of the people of the country, to try and do that for them which they cannot be fairly asked individually to do for themselves. I am satisfied, however, that to accomplish this work of cold storage so that it will be a permanent success it is necessary that it should not be overburdened by too large an expenditure of money. If we were to go to work and establish enormous warehouses all over the country, and have every steamship that went out of Canada fitted with cold storage compartments, and if at the end of next season it was found that those warehouses had not been utilized, and that many of those ships had gone away with only a half or a quarter of their cold storage accommodation utilized, the result would be to throw discredit on the whole scheme, and the freight would be burdened with the enormous expenditure, the profits of which would have to be borne by the trade. I want to see that at the end of next season the people of this country will be so appreciative of the cold storage which may be supplied, and so satisfied of its success, that they will call for more instead of saying that we have had too much. I am satisfied that this is the way in which we ought to act, and this is the line which I ought to keep before me all the time ; and I am sure that the true interests of the trade would be much better and more largely supplied in that way than they would be to launch out extravagantly and largely at the first inception, and then find that we had made a mistake and gone too far. For what has been said in this convention at the meetings I attended of fruit growers of the Annapolis and Cornwallis Valleys, there is evidently some little doubt as to the way in which this cold storage can be best utilized or arranged for. Let us then proceed slowly and in an experimental way until we know exactly what we can do to the profit and advantage of the whole trade. When we have found that out by careful experiment, then let us launch out to the utmost extent that may be necessary in the interests of the trade of the whole country, and do it on a firm footing ; but if we go into it in the meantime and make a mistake of any kind we will throw more of a damper on the trade, so to speak, in the future. Before closing I wish to congratulate you on this splendid convention. The fruit growers of Ontario are more favorably situated judging from your success in exporting, than even many of the States to the south ; and as the quality of the Canadian product is on the average better than that of the more southern product, I do not see why you should not have a good market even in the American States for a good deal of your production, situated as you are so close to the enormous consuming centres in the American Republic. The Province of Ontairo probably will have to supply for a number of years to come the large bulk of the home market of Canada The great North West is opening up, and you ought to send fruit there provided the freight rates are such that you can. In Manitoba and North-West they cannot produce such fruit as you have, owing to climatic conditions, and till you get to the point where the British Columbia fruit would come eastward as yours was going westward you ought to have a large market. We cannot get that market there until we get the people into the country ; and the best way to develop the country is to show in the old lands that such things as these can be produced here—the delicate and the best productions of the earth—and that we have a people who show by their skill and intelligence that they can produce these things. I am a farmer, and whenever I address farmers I try to impress upon them that what they should do is to use their brains instead of their hands. It has been the general impression—and the farmers of the country have lent color to it—that any fool could be a farmer ; but in my experience of twenty-five years on the farm and in going about the country I have learned by experience and observation that there is no business or profession in life in which a man who succeeds and does his duty by himself and his country requires such a high intellectual culture as a man who cultivates the soil and succeds in that cultivation. (Applause.) The young men who are rising up among us

and going to school and college, and who have to choose a career in life, need not for a moment turn aside from the cultivation of the soil, from farming and gardening, from dairying and fruit orcharding, because they are afraid that they will not in those careers find a large enough and good enough scope for their intellectual activity as well as for the exercise of their muscles and their hands. On the contrary, they will find as large a scope, if not larger, than they can in any of the other professions or walks of life. I trust these things are better understood, and as our young people are growing up and finding what they can do and how than can turn their best energies and intellects to these developments, we may find the brightest and best of our young people, boys and girls both, stay on the land, working on that land, and showing that in that work they can be the best of citizens and do the best for their common country.

Principal GRANT: I think that after hearing this impromptu address of the Hon. Mr. Fisher we will all be unanimous in the opinion that he is not only a farmer but that he is something else—(laughter)—and we rejoice that we have such farmers as he and Mr. Dryden; and depend upon it, as long as the country produces such as these we will be at no loss for getting Ministers of Agriculture. It was also a great pleasure to me to bear witness to the excellent work of his predecessor, and also with that official of his with whom we came most in contact here—Prof. Robertson—to whom we all have a very grateful feeling for the interest he has always taken in our work.

ORGANIC EVOLUTION

Prof. KNIGHT then gave his lecture on "Organic Evolution," which does not appear here, as this report deals only with practical fruit-growing.

REPORT OF SPECIAL COMMITTEE ON FINANCES.

Mr. E D SMITH read the report of the Special Committee appointed to consider the financial position of the Association, as follows:

Your committee beg leave to report as follows:

1. We think the annual statement should show the assets and liabilities as well as the expenditure and receipts for the year.

2. That the auditors might look carefully into the figures presented each year not only as to their accuracy, but also to suggest any economies that they may think might be effected if any.

3. With regard to the item of $1,834 for printing *Horticulturist* for 1896, we find about $1,450 only was the cost of printing, or about three cents per copy, or $120 per edition of 4,000 copies of forty pages, the balance being for sundry items in connection with printing and distribution. We are unable to say whether $120 for printing each edition is excessive or not, but beg to suggest that tenders should be invited from a considerable number of printing establishments, including some country towns, with a view of getting the lowest price without, however, in any way impairing the quality or style of the publication.

4. We note that of late fewer chromo-lithographs are used, which are expensive, and their place taken by photo-engravings, which are not only much more economical, but are more accurate representations, many of the lithographs being but exaggerated imitations of the natural fruit.

Lastly, we would suggest that whatever economies may be effected, if any, go towards enlarging and improving the *Horticulturist* complaints being made by members of affiliated societies that not enough space is given to amateur gardening and floriculture, and on the other hand practical growers cannot easily be induced, even by the prospect of getting a free plant, to part with their hard dollars in exchange for twelve numbers of the

paper, saying that they can get better value elsewhere. While we would not dare to say extensive improvements can be made with present receipts, we would respectfully suggest that a fruit journal equal to any in America ought to receive and we think would receive an enormously increased circulation, especially if accompanied, as the *Horticulturist* is, with a number of enticing side lines.

Mr. SMITH added that he would like to see a journal, if possible, with such a large scope that the members would be glad to pay a dollar for it. While the free plant distribution is not considered of very much value by many practical growers, yet without it it had been considered more difficult to get subscribers than at present.

The PRESIDENT stated that the Directors last night passed a resolution to take steps to reduce, if possible, the cost of the publication.

On motion of Mr. SCARFF, seconded by Mr. CASTON, the report was adopted.

REPORT ON FRUIT EXHIBIT.

Mr. RACE reported on the fruit exhibit and on motion of Mr. Huggard, seconded by Mr. Orr, the report was adopted as follows :

Having examined the fruit exhibit of the tables before us we have pleasure in reporting it one of the largest and finest in the history of the Association. Among the largest individual collections is one shown by Messrs. Stone & Wellington, consisting of about fifty varieties. Among the varieties worthy of special mention we find Wine Sap, Rubicon, Swazie Pomme Grise, Lawver, Sutton's Beauty, Boiken—thought to be a coming popular apple—Gano, and many other new sorts not yet in general cultivation.

A. E. Sherringto of Walkerton, shows a collection of only fair samples of several well known varieties

Mr. A. M. Smi of St. Catharines, shows a collection consisting of Champion Quince, D'Anjou, Jo hine, Lawrence and President Drouard pears ; also a red apple, seedling of the Ribst pippin, with flavor of parent, and a longer keeper, but not otherwise equal to it.

Mr. Dempsey, of Trenton, exhibits a collection of about fifty varieties of apples, among them a very fine sample of Ontario, Seek-no-Further, Ben Davis in several sizes and shapes, Stark, Newtown Pippin, Hubbardson's Non-such, Reinette, Grise—a favorite in France—two seedlings from the Spy and Russet, and another fine red fall apple without name. Mr. Dempsey also shows a seedling pear, a cross between Josephine and Duchess de Bordeaux, size medium, early winter and of extra fine quality. We recommend it strongly as worthy of propagation and general cultivation.

Mr. J. S. Scarff, of Woodstock, shows about twenty-five varieties of apples, the collection containing a very fine Blenheim Orange, Fallawater, Ontario and Spy.

Mr. Beall, of Lindsay, shows an Ontario and another variety without name resembling Ribston pippin somewhat, but without its flavor.

Mr. E. H. Wartman, of Kingston, shows a very superior Spy, Baldwin, Snow and Ben Davis.

Secretary Woolverton shows a collection of about sixteen varieties of apples, among them Princess Louise, King, Wagener, Spy, Cranberry pippin and Cooper's Market.

Mr. Harold Jones, of Maitland, shows the handsome Scarlet Pippin, Pewaukee, Alexander, Blue Pearmain, Yellowe Bllflower and Canada Red.

Mr. Huggard, of Whitby, exhibits a collection of twenty-six kinds, among them the Canada Red, Cayuga Redstreak, Duchess and several well known sorts. He also

shows an assortment of pears from his cold storage, consisting of about a dozen specimens.

Mr. R. W. Sheppard, of Montreal, shows a new seedling named Rochelle, an apple of medium size, good appearance, yellow splashed with red and of fair quality.

A seedling of the Fameuse family, good size, dark red in color, shown by Mr. Nichol, of Cataraqui, is an apple of very attractive appearance, but not up to the mark in quality.

A seedling known as Oliver's Seedling, shown by T. H. Race, of Mitchell, is an apple of large size, nicely splashed with red, looks like a good keeper and good shipper, and is of good quality as a cooking apple. Mr. Race also shows an apple supposed to be Plum's Cider; another, the Walbridge; and another, the Bottle Greening.

Mr. W. S. Turner, of Cornwall, shows a fine collection of about fifteen varieties, among them the Gideon, La Rue, a very superior McIntosh red, Wealthy, Wolf River, Red Beitigheimer, Talman Sweet, Princess Louise, a new variety called Stone, and several other well-known sorts.

Special claims are made for the following: 1. Wismer's dessert, by Mr. J. H. Wismer, of Port Elgin. It is a fair size, yellow splashed with red, very fine texture and choice quality for a dessert apple. 2. The Scarlet Pippin shown by Mr. H. Jones, in our opinion a rival of the Snow as a handsome dessert apple, and promises to become a favorite. 3. A seedling shown by Mr. W. C. Reid, of Belleville, much resembling the Snow and, in some features, the McIntosh Red. It is an apple of considerable promise, as an attractive dessert apple.

Extra fine specimens of the Pewaukee are shown by Mr. A. W. Peart, of Freeman.

Mr. M. Pettit, of Winona, shows a fine collection of grapes, among them the Cantawba, Salem and Herbert.

Mr. W. M. Orr also shows a very choice lot of Vergennes.

T. H. Race,
H. L Hutt,
E. Morris.

REPORT OF COMMITTEE ON NEW FRUITS AND SEEDLING APPLES.

Prof. Craig read the following report on behalf of the Committee:

I am pleased to report an increased interest on the part of owners of seedling apples in bringing these apples to public notice for the purpose of ascertaining their particular features of usefulness with a view of introducing them if thought sufficiently valuable. In continuation of the work begun two years ago, a considerable number of varieties have been received and examined this year; where thought worthy they were described in detail and scions were asked for. In most instances growers have furnished these without hesitation, always being assured that their distribution would, until permission was given by the grower, be restricted to the various experimental stations.

In this connection I may be allowed to urge upon persons sending these seedling fruits, the necessity of wrapping each specimen in paper and enclosing them in a strong cardboard box, together with a history and description of the tree, the name of the sender and that of the owner or introducer. A number of packages have been received without anything but the post mark to identify them by, and sometimes minus that. This leads to confusion and enhances the labor of recording the necessary data. Suitable mailing boxes will be furnished by the Horticultural Division, Central Experimental Farm, Ottawa, on application, to those who wish to forward samples of seedling or other fruits for examination. It is also desirable to send six specimens in each case, so that they may be distributed to the three members of the Committee on New Fruits. Infor-

mation regarding the fruits received is given in condensed form in the following tabular statement. Where thought worthy a fuller description is appended :

SEEDLING APPLES.

Sender.		Remarks.
Province.	Name.	
*Prince Edward Island..	Gill, John H., Little York...	Medium to large; yellow; flesh juicy, with peculiar quince flavor.
Prince Edward Island..	Ward, W. M., Uptown	Three distinct seedlings; not valuable.
Nova Scotia, C. B	Paint, Miss M., Port Hawkesbury	Crab; not equal to others in cultivation.
New Brunswick	Williams, B., Long Reach....	Medium size; round; yellow; winter.
*Quebec.....	Dart, Rev. W. J.,St. Lambert.	Northern Spy seedling; much resembles parent in appearance and quality; winter,
Quebec.....	Frazer, John, Coaticooke	Small size; round; red; winter.
*Quebec.....	Herrick, J. E. K., Abbotsford.	"Herrick"; good for cooking only; keeps well; mid-winter.
*Quebec.....	Herrick, J. E. K., Abbotsford.	"Bangle"; medium size; handsome; fair quality; early winter.
Quebec.....	La Trappe, Oka	No. 1; medium size; poor quality.
Quebec.....	La Trappe, Oka	No. 2; small; crimson; winter.
Quebec.....	La Trappe, Oka	No. 3; small; yellow; long keeper; cooking.
*Ontario	Allan, A. McD., Goderich ...	"Williams"; small; compact; acid, juicy; late winter.
*Ontario	Burgess, Amos, Bala...	Crab; good size; handsome; September.
*Ontario	Clare, R. P, Rideau Centre..	Medium size; yellow; firm; good; winter.
Ontario	Fisher, M. J., Maxville.....	"Sir Oliver"; red; juicy; fair; resembles "Gravenstein" in appearance and season; medium size.
Ontario	Graham, J. J., Vandeleur ...	Medium to large; green; firm; acid; winter.
Ontario	Graham, J. J., Vandeleur....	Medium size; red; poor quality; autumn.
Ontario	Greenfield, S., Ottawa East..	Large; red; poor quality.
Ontario	Greenfield, S., Ottawa East ..	No. 2; small; yellow; good winter.
*Ontario	Greenfield, S., Ottawa East ..	No. 4; medium; yellow; good winter.
Ontario	Greenfield, S., Ottawa East ..	Medium; yellow; poor quality; winter.
Ontario	Herriman, Dr. W. L.....	Autumn; quality medium to poor.
Ontario	Kerr, W. J., Renfrew.....	"Knight's Russet"; a small, sweet, white fleshed russet; may be locally valuable; autumn.
Ontario	Kerr, W. J. Renfrew	"Knight's No. 1"; resembles St. Lawrence; two or three weeks later; handsome; fair quality; autumn.
Ontario	Kerr, W. J., Renfrew.....	"Fraser's No. 1"; small; poor quality; autumn.
Ontario	Kerr, W. J., Renfrew.....	Seedling; Blue Pearmain type; worthless.
Ontario	Kittermaster, A. R., Orillia..	Medium size and quality; early.
Ontario	Leef, W. H., Orillia	Large; green; poor quality.
Ontario	Lowery, E. D., St. Davids...	Small; said to be a crab; September.
*Ontario	Morse, S. P., Milton.....	Medium to large; yellow; quality best; promising; probably a seedling of Early Harvest; early summer.
*Ontario	Morse, S. P., Milton	Medium to large; oblate; red; sweet; late winter.
Ontario	McConnell, H. L., Grovesend.	Medium size; crimson; good quality; winter.
*Ontario	Ramer, John H., Markham..	Medium size; yellow; good quality; not attractive; good keeper.
Ontario	Roberts, C. H., Paris	"Ridgemount"; medium size; sweet; summer; not good enough to compete with "Duchess."
Ontario	Roberts, C. H., Paris	"Allan Ridgemount"; medium; yellow; fair; mid-winter.
Ontario		
*Ontario	Williamson, W. P., Port Nelson	Small; oblate; yellow; good; mid-winter.

PLUMS.

*Nova Scotia.....	McFarlane, D. H., Pictou....	Seedling of White Magnum Bonum; good quality; season, late September.
Nova Scotia....	McFarlane, D. H., Pictou....	Seedling of White Magnum Bonum; blue; nearly free; fair quality.
Ontario	Ruth, S., Ridgetown	Blue; size of Lombard; cling; late August.
*Ontario	Smith, A. M., St. Catharines.	"Smith's October"; medium size; nearly black; cling; fair quality; October.
Ontario	Stephens, C L., Orillia	Seedling; native red; good quality.
Manitoba	Bell, James, Minette	9 samples Native Manitoba plum; Nos. 1 to 3 worthy of propogation in Manitoba.

PEACHES.

*Ontario	Bruner. M. G., Olinda.....	"Corlett"; medium; pink; yellow; free, end of July.
Ontario	Whaley, M., Olinda.....	"Ermine"; medium; partially free; pit large; ripe first week in August.

GOOSEBERRIES.

Ontario	Stephens, C. L., Orillia	Medium size; white; fair quality; July 10th.

CURRANTS.

Ontario	Stephens, C. L., Orillia.....	Red Dutch type, but sweeter; July 10th.

GRAPES.

Ontario	Gordon, J. K., Whitby.....	Large; black; juicy; acid; thin skin; late.

APPLES.

Seedling Apple. From W. J. WILLIAMSON, Port Nelson, Ont., Jan. 20th, 1896.—Small, oblate, yellow ground nearly covered with crimson stripes and splashes. Cavity, deep and russetted. Stem, slender. Basin, shallow, eye open. Flesh, yellow, crisp, breaking, very juicy, pleasant. Size of this apple rather against it, otherwise, promising; worthy of further trial. Season, midwinter.

Seedling No. 4, Greenfield. March 4th, 1896.—Medium size, conical, yellow ground with light red striping. Flesh, yellow, firm, juicy, sprightly sub-acid, good, with Roxbury, Russet flavor, Large mellow core. A keeper. Worthy of further trial.

Seedling Apple. From J. H. RAMER, Markham, Ont., April 30th, 1896.—Above medium; roundish, oblate, tapering rapidly towards calyx. Skin, rough, golden yellow, russet dots, blushed with light red towards cavity. Cavity of medium size. Stem $\frac{1}{2}$ to $\frac{3}{4}$ inch long, smooth. Basin, small, almost wanting, calyx closed. Flesh, white, flaky, juicy, mild sub-acid. Quality good at this season, April 30. Fruit not very attractive, but regular in form, and otherwise desirable. Forwarded by Dr. Beadle. Mr. Ramer says:—"The tree was planted in 1823 and is now 73 years old. My father, Peter Ramer, planted nearly 300, all seedlings, on about five acres, and there were not two trees that bore apples alike—all different. I think he brought the seed from the States. They are

* A named English variety.

generally good keepers, and we usually have some until June. I have kept some odd ones until September. The tree has had a number of the limbs broken off by ice storms these last few years. The tree bears every year and is very full of buds again."

Seedling Apple. From S. P. Morse, Milton, Ont. August 14th, 1896.—Large, round regular, clear yellow skin, smooth, glossy, with more or less indistinct black dots. Cavity, broad, sloping rapidly. Stem, medium length. Basin, small, round, smooth, eye open. Flesh, white, tender, melting, buttery and juicy, with a peculiar pear-like flavor and aroma. Said to be a seedling of Early Harvest. Very fine, promising and worth propagating, if tree is vigorous. Mr. Morse says :—"I take it to be a chance seedling of the old Yellow Harvest, because the tree sprang up not far from one of that variety which it very much resembles in many points, but is more vigorous. The fruit is much larger, finer in texture, better form and exempt from fusicladium. It is here pronounced the 'best of all harvest apples.'"

Seedling Apple. From A. L. McConnell, Grovesend, Ont., Sept. 15, 1896.—Fruit medium, round, remarkably regular in form, entirely covered with crimson and thickly dotted with large whitish specks, very handsome. Cavity, almost wanting. Stem 1-16 to ¼ inch long. Calyx, open. Basin, small, shallow, only a slight depression. Flesh, white tinged with red near calyx, juicy, mild sub-acid, melting; quality good. Said by Mr. McConnell to be a keeper, but in good eating condition, September 22nd, 1896. Mr. McConnell says :—"Small and imperfect specimens of seedling grown by myself. The tree is a remarkably strong symmetrical grower, and an annual bearer. Fruit not subject to scab, very uniform in size and shape. The enclosed specimens are culls, the best having been used."

Seedling Apple. From F. P. Clare, Rideau Centre, Ont., Oct. 10th, 1896.—Medium to large, round, sloping to calyx. Skin, yellow, partly covered with a bright red blush. Cavity entirely wanting in some specimens. Stem, large, 1 inch long, very obtrusive; except for this the apple would be valuable. Calyx closed, set in a deep narrow basin. Flesh, white, firm, crisp, juicy, peculiarly melting, rather acid. Season, midwinter. Mr. Clare says :—"The seedling originated on the farm of a Mr. Pattie, between L'Orignal and Vankleek Hill, about sixty miles east of Ottawa, and is commonly known as the Joe Pattie apple. The tree is a fair bearer, bearing every year; a very thrifty grower, perfectly hardy, but its chief point of merit is its keeping qualities. In our cellar, it keeps perfectly until April or May, when apples are worth from $1.00 to $1.25 per bushel. So convinced am I of its worth, that I have been grafting from it for the past two springs. It and the Canada Red are the two best keeping apples that I have found for this climate."

Seedling Apple No. 3. From S. P. Morse, Milton, Ont., Oct. 29th, 1896.—Tree resembling Spy. Fruit slightly above medium, flat and oblate, conic towards eye, regular. Skin, smooth, green, well covered with dark red, suffused or in stripes, numerous small dots. Cavity, smooth, broad, sloping and deep. Stem, ⅝ to 1 inch long, fairly stout. Basin small, shallow. Calyx, small, open or partly closed. Flesh, white crisp, juicy sweet, very pleasant and melting. Not ripe at this date. Core small. Seeds large, plump. Appears to be a valuable sweet winter apple. Mr. Morse says :—"Tree like the Spy finely fastigiate, very vigorous. It has no marked excess of those small spray-like twigs that infest the growth of the Spy and produce most of its worthless fruit. The crop is produced, mainly, on the wood of the last year's growth, and being large weighs down in weeping form the branches with its uniformly large bright copiae, an emblem of humility in the midst of luxury. Holds well to the tree."

Seedling Apple. From J. H. Gill, Little York, P.E.I., Nov. 11th, 1896.—Above medium, obling, slightly conic obscurely five-sided. Skin, green, glossy with pinkish blush on one side. Cavity broad, moderately deep. Stem ¾ to 1 inch long, stout, thickened at base, curved. Basin shallow, wrinkled. Calyx large, closed. Flesh white, juicy, but not melting, with a quince-like flavor, decidedly peculiar but pleasant. Core large open. Very nice. Worth propagation on account of its flavor and keeping properties. Prof. Jas. Fletcher says it reminds him of the Quince Pippin of England.

Apple Seedling, "Bangle."—From J. E. K. Herrick, Abbotsford, Que., Nov. 16th, 1896.—Large or above medium, oblate, regular, smooth. Skin greenish yellow, mostly covered with light red stripings and blotchings. Cavity, broad and deep, sometimes russetted. Stem, slender, ½ to ¾ inch long. Basin, small, round. Calyx partly closed. Flesh yellowish white with a distinct St. Lawrence flavor, rather mealy, slightly lacking in juice at this date; kept in a rather dry place; fair in January. A chance seedling which came up in the garden and was allowed to grow. Tree about 25 years of age, roundish top hardy; a heavy alternate bearer. Probably a seedling of St. Lawrence. Named after the owner of the farm. Worthy of further trial.

Apple Seedling (of Northern Spy). From Rev. W. J. Dart, St. Lambert, Que., Nov. 16th, 1896.—Medium or under, Northern Spy in shape, with the same ribbings more or less distinct. Color solid dark crimson. Cavity broad and deep. Stem, long, stout. Basin small, shallow. Flesh yellow, firm crisp, almost identical with Northern Spy in flavor. Specimens received have been too much dried. They were also affected by skin spot. Season, midwinter. Tree about 15 years of age, hardy. Mr. Dart says:—"At our annual horticultural exhibition we had a plate of apples shown which seem worthy of notice. These apples were shown by Mr John Duckworth, G.T.R. Bridge Inspector. He says that ten or eleven years ago he planted some seeds from a Northern Spy apple. One of the trees, never grafted, has borne this year and the fruit is very like Northern Spy in color, shape, and is very firm and heavy. The tree is quite hardy here at St. Lambert, and has never been winter killed. The garden where it stands is about half a mile from the bank of the St. Lawrence and is rather sheltered. They look as if they would be good keepers and prove a valuable winter apple for the Province of Quebec."

Williams Apple. From A. McD. Allan, Goderich, Ont., Nov. 16th, 1896.—Small, roundish, conic; yellow skin with pinkish stripes on one side. Cavity, very shallow, Stem short, ⅜ to ½ inch, with prominent terminal knot. Basin shallow with slight ribbing. Flesh, yellowish white, firm, crisp, very juicy, acid and aromatic. Core small, open. Rather promising on account of compactness of form, and pleasant acidity of flesh. Should be valuable as a winter kitchen apple. Season, late winter.

Crab Apples.

Seedling Crab. From J. P. Cockburn, Gravenhurst, Ont. Grown by Amos Burgess, Bala, Ont.—Medium size, round, regular, bright scarlet. Skin, smooth, shiny, red Siberian type. Stem long. Flesh crisp, juicy, firm, slightly astringent. Probably a good jelly variety. Season, end of August. Promising on account of beauty and fair quality.

Peaches.

Corlett Seedling. From M. G. Bruner, Olinda, Ont., July 27th, 1896.—Size, 2 inches longitudinally, 2½ inches laterally; smooth and regular, nearly round. Suture, shallow extending half round. Stem set in a deep cavity. Skin greenish yellow when fully ripe, fairly well colored with a pink blush towards stem end. Flesh pale yellow without red markings, quite free, moderately firm, very juicy and sweet. Seems to be a promising early variety. Mr. Bruner says:—"I send sample of seedling peach for inspection. The producer says it is a free stone seedling, of good flavor, and grows evenly distributed on the tree. Please call it Corlett's seedling, which is the name of the producer. The trees grow much the same shape as the Amsden June."

Plums.

Smith's October. From A. M. Smith, St. Catharines, Ont., Oct. 4th, 1896.—Medium size, 1⅜ inches each way, nearly black when fully ripe; slightly one-sided. Suture obscure; blue bloom, with some mottling. Flesh brownish yellow, clings to stone. Stone globular, with deep hollow alongside a very thick margin. Mr. Allan does not think that

other varieties of the same season are fully as valuable. He says:—"There are many seedlings in this section of this class, but owing to the fact that they are like this, under size, and not possessing any distinguishing points to recommend them specially, I have never brought them to notice. Besides being late, they seem to be past the time when a demand exists generally for the plum. Coe is as late as I have found value for a plum, and I would be inclined to pass anything late unless it was large and a good cooking plum with free stone, if possible. There might be some money in such an one. It is undoubtedly a good cooker."

Plum. Seedling of White Magnum Bonum. From D. H. McFarlane, Pictou, N.S., Sept. 28th, 1896.—Medium to large, egg-shaped, tapering towards stem. Suture plainly marked, but not deep. Stem fairly stout, 1¼ inches long. Skin, greenish yellow with light lilac bloom. Flesh yellow, firm, good quality, closely adherent to stone. Stone, small, flat, one sided, hollow near wing. Somewhat one sided. Season, last week of September or 1st of October; in best condition probably in the middle of September. Mr. McFarlane says the samples are undersized.

Mr. A. McD. Allan says:—"The plum, seedling of White Magnum Bonum (Yellow Egg,) strongly resembles Coe's in form, only smoother in skin The mottle, which is distinct, resembles Imperial Gage. The pit has a close similarity to the parent, quality good. With us it would scarcely have a place for introduction, owing to the fact that it is about the same season as Coe's and scarcely as large. But it may be valuable for other sections if the tree has hardiness to recommend it. Doubtless bearing quality will be all right, and flavor is good for cooking; the sprightly sub-acid tinge almost makes it desirable for eating, being distinctly a variance from the heavier flavor of Yellow Gage. It has also more juice and finer grain, Pity it is a cling."

Supplementary Report.

The following supplementary pages were added by the Secretary:—

During the past season a good many new fruits have been brought under the notice of your Secretary, some of them scarcely worthy of notice, while others seem to give promise of considerable value. Among them are the following:—

Apples.

Morse's Harvest Apple. Received on August 13th from S. P. Morse, of Milton, Ontario.—It is larger in size than the Early Harvest and is free from scab. It resembles the Early Harvest in color and form, except that it is somewhat conical. It is later by about two weeks. The quality is very good, the flesh, white, tender, juicy and and aromatic.

Morse's Seedling No. 3. Samples of this apple were received on October 30th, from S. P. Morse, of Milton. Size, above medium, oblate, slightly conical; color, yellowish green, striped and shaded with light and dark shades of pinkish red, with a greyish bloom, and numerous obscure light green dots. Stem broken, set in a narrow, deep cavity; calyx closed in a corrugated basin, with five crowns. Flesh, white, juicy, meaty, crisp; flavor, rich, agreeable, excellent. Concerning this apple, Mr. Morse writes:—"The specimen sent is a fair average; indeed there are no small fruits ever produced, all large and usually better colored than the sample which was gathered prematurely. The habit of the tree is fastigiate, like the Spy, equally vigorous, with fewer small spraylike twigs producing imperfectly developed fruit. Crop is borne chiefly on the last year's wood.

Mountain Seedling. Found growing by the Secretary on the side of the mountain on his farm at Grimsby.—It has several interesting peculiarities. 1st, a wonderfully heavy bloom, 2nd flesh deeply stained with red all the way through, 3rd, skin abnormally thick and tough

Rochelle. A sample of this apple came to hand from R. W. SHEPHERD, of Montreal on the 19th of November.—It somewhat resembles the Cranberry Pippin externally, except that it is more oblate, and has a peculiarly, large, deep and abrupt basin. Fruit, large, unequal, roundish oblate, somewhat uneven, obscurely ribbed; stem broken in sample, set in a narrow, deep cavity with prominent fleshy lip on one side; calyx open in a large, deep, abrupt, uneven basin; color, yellowish green, shaded and striped with light and dark shades of bright red.

Scarlet Pippin. This apple originated on the farm of HAROLD JONES, near Brockville, and belongs to the same family as the Snow, McIntosh and several others of our most valuable dessert apples. It has been described by Mr. Craig, and a section of the apple is given herewith. The description is omitted, because it has already been given by Mr. Craig.

PEACHES.

Whaley's Favorite. A seedling peach raised by MARK WHALEY, of Olinda, Esq., Co., Ontario.—Samples of this peach were sent in to the Secretary during the first week in August, and they are claimed by the originator to be in season about two weeks in advance of the Crawford. The peach is yellow in flesh, of attractive appearance, of fair size and almost a freestone. Apparently well worthy of testing.

PEARS.

Sapiega. Scions received from JAROSLAV NIEMETZ, of Russia. Fruited by L. Woolverton, Grimsby: matured, August 13th. Size, medium, oblate, beautiful color, yellow with reddish fawn cheek; flesh, somewhat firm, juicy, agreeable, not equal to the Clapp's Favorite of the same season.

PLUMS.

Early Blue. From A. M. SMITH, St. Catharines.—Very early plum about the size of Lombard, but of much better quality. The samples were sent in about the 15th of July. Its earliness was its chief point of recommendation.

Native Red. From W. N. SNELLING, of Ottawa. The plum has already been reported upon by Professor Craig. It is of fair size, bright red and very attractive.

SMALL FRUITS.

Smith's Giant Black Cap. This raspberry is a seedling raised by A. M. SMITH, of St. Catharines.—On the 8th of July it was visited by the Secretary of the Ontario Fruit Growers' Association who reports that it was carrying a very large load of fruit. Mr. Smiths claims for it hardiness and productiveness, and Mr. G. C. Caston, who has tested it at Simcoe Fruit Experiment Station, reports that it is hardy at that place. In other respects it much resembles the Gregg.

FRUIT GROWING IN THE MIDLAND DISTRICT.

BY MR. JAMES DALY.

MR DALY prefaced his paper by remarking that by the Midland District he meant the vicinity immediately surrounding Kingston.

Fruit growing in the Midland District in the past has been a series of experiments, many of which have been disastrous failures on account of want of knowledge of what varieties were best adapted to our soil and climate; but enough have been successful to prove to us that most, if not all the fruits grown in this Province except

peaches can be grown here to great perfection. Twenty years ago the greater portion of fruit consumed in the city of Kingston was brought from Niagara district or the United States, but to-day we are independent of the western part of the Province or the States. As far as the growing of apples is concerned we stand at the head of the list of competitors for the last ten years at our own great exhibition, namely, Montreal Provincial, open to the world, and Central Canada exhibition at Ottawa, also open to the world. This being the fact should we not ask ourselves the question, what is to be done in this great industry in the future? Are we to stop contented with what we have accomplished, or shall we not persevere and develop the large resources within our reach? There is no part of the Province that has so much land as we have bordering on the River St. Lawrence and Lake Ontario which is particularly adapted to the growing of apples to great perfection; and although we have not a very large portion of country adapted to the growing of pears and grapes, still we have enough to supply our own market and some to spare. Cherries, plums and most of the small fruits can be grown in the Midland district to perfection, and when we consider the great demand for fruit and the increased consumption owing to the new markets opened up to us, we can easily see that this industry is but in its infancy, and if we carefully improve the advantage we enjoy fruit growing will become a source of income to this part of the Province.

The question of how best to accomplish this object, or how to make fruit growing pay is one that should deeply interest us all, but I do not consider myself competent to answer all of those questions. Still I may be able to offer a few suggestions that may be of some value in the future. I remarked in the beginning that many of us have had great failures caused by planting the wrong varieties, but now this need not occur again if we only become members of the Fruit-Growers' Association, and profit by their experience and observations, and remember not to plant too many varieties of fruit unless there is a demand in the market for them. I would strongly recommend growers in the future to plant only apples of a commercial character, that is to say, apples that can be shipped to both our local and foreign markets, and when those are planted they should be carefully looked after and fed in order to make them pay. The day is fast coming when nothing but first-class fruit will pay, and in order to accomplish this result we must give strict attention not only to planting and cultivating but also to the destruction of all insect pests and the prevention of fungous diseases which our fruits are subject to. In putting up fruit for market there has also to be a great change. I think we might very profitably take a lesson from our western neighbors in the Grimsby and Niagara districts. If it pays them to wrap carefully their fruit in paper and pack it in nice boxes, why would it not pay us? I feel assured it will not be long until our choice applies will be wrapped and sent in cold storage to the markets of Europe, and we all hail the happy day when fruit growers can send their fruits across the ocean at all seasons of the year. But I need not dwell upon this matter as the Fruit Growers' Association has this project under consideration and I most sincerely regret that in the wise deliberations of your association in the past you have no seen fit to establish an experiment station in the Midland District, but I still cherish the hope that before bringing to a close the business of your session you may see your way clear to grant to us this small concession which would stimulate the business of fruit growing and become an everlasting boon to the residents of the Midland District.

The SECRETARY read a letter from Messrs. Hart and Tuckwell calling attention to an apple called the Longevity, also a letter from Mr. Shuttleworth, of Brantford, regretting his absence on account of illness.

FRUIT SPRAYING, INSECTS AND OTHER ENEMIES OF THE FRUIT GROWER.

By Mr. W. M. Orr, Superintendent of Spraying Experiments.

In conducting the experimental spraying of apple trees carried on by the Department of Agriculture in Ontario, we experimented at twenty-nine points, covering the territory from London to Winchester, a distance of about four hundred miles.

The year 1896 has in many respects been unique in apple culture. It has given us the largest crop of apples that we have ever had. In some sections insect enemies were numerous. In a few orchards there were scarcely any to be found.

The principal insect enemies that we had to contend with were the canker worm, codling moth, tent caterpillar and bud moth.

Most orchards were infested with one or more of these, and some with all of them. The farther north and east we went the fewer insects we found. The opinion was expressed by growers that the frost of June, 1895, had been destructive to insect life, and in this way they accounted for their immunity or partial immunity from their ravages. Others think that on account of the short crop of fruit, they could not propagate as in former years. The canker worm has appeared in many orchards this year where it was unknown before, and some orchards where they have been for years, particularly in the Counties of Wentworth and Brant, have been almost entirely defoliated, many trees being as bare of foliage in July as they are in January. Of course the crop was lost for this year, the trees stunted and no prospect of a crop for next year. There are orchards in which they are allowed to do their work of destruction from year to year, thus perpetuating and extending the evil. It is a question whether we should not have legislation compelling owners of infested orchards to spray them, which, if properly done, will effectually end the trouble and thus benefit the owner and save his neighbors from the pest.

Neither this year nor last were favorable to fungus growth, the seasons being dry, but in some sections where we did experimental work this year there was an abundance of rain and a good deal of close hot weather which caused a considerable development of fungus and did serious damage to fruit and foliage where the trees had not been sprayed.

It appears to be beyond question that to grow apples successfully we must spray, indeed I believe it to be as important as trimming, fertilizing or cultivation. The land occupied by the trees is the same whether the fruit is clean or otherwise, and it costs about twice as much to handle a crop of apples when half of them are defective as it does when they are all clean, not only is the labor lost, but in many cases half the fruit which if clean would be clear profit. Thus it appears that the loss on scabbed and wormy fruit is considerable to the individual and to the Province it is enormous.

It may be asked by some, can insect enemies and fungus be profitably controlled by spraying so that we may have clean fruit? We answer yes, and will give you a few instances of results of our work this year in confirmation.

In the orchard of Mr. Jacob B. Shantz, of Waterloo, which had never been sprayed before this year, the results were as follows:

Snow apples sprayed six times in experimental work, 82 per cent. clean.
Snow apples sprayed twice by Mr. Shantz 21 per cent. clean.
Snow apples unsprayed, 5 per cent. clean.
Newton pippins sprayed six times in experimental work, 67 per cent. clean.
Newton pippins sprayed twice by Mr. Shantz, 50 per cent. clean.
Newton pippins unsprayed, 5 per cent. clean.
Swaar apples sprayed six times in experimental work, 68 per cent. clean.
Swaar apples unsprayed, 4 per cent. clean.

The results would probably have been more marked in favor of the six applications had it been possible to have made them just at the proper time and on a fine

dry day. But the work had to be performed on the dates announced and as a consequence the first and third applications were followed by rain within a few hours.

In the orchard of Mr. A. Pay, of St. Catharines, where the experimental spraying for the County of Lincoln was conducted, six applications of Bordeaux mixture and Paris green were given to the experimental plot and three applications to the remainder of the orchard. This orchard had never been sprayed before, and Mr. Pay says that in former years more than one-half of the crop has been wormy and spotted. The following results were obtained :

In Fall pippins which had been sprayed, five barrels of bright clean fruit free from worms, and less than half a bushel of culls, rejected for size, were taken from a tree.

In Fall pippins which had not been sprayed, from one tree, three barrels of fruit were packed. There were not so bright or free from spot as the No. 1 sprayed, and two barrels were culled for worm and spot.

In Greenings which had been sprayed, five men packed 125 barrels in a day and and there were less than five barrels of culls. These culls were not spotted or wormy but undersize. This lot of fruit sold in Glasgow on Oct. 9th at eleven shillings per barrel, the consignee writing that they were very fine.

In Greenings which had not been sprayed, the same gang did not pack more than half as many barrels in a day, although they handled as many apples, so many having to be rejected as imperfect.

In Snow apples the result was very marked. Three trees, which were sprayed three times, gave eighteen barrels of beautiful fruit, free from worm or spot. Mr. Pay says that these trees have borne crops for seven or eight years, but that they have never been fit to pack before. He also considers that the foliage on the sprayed trees appeared more healthy than that on the unsprayed trees.

Mr. W. H. Heard, of St. Thomas, has sprayed his orchard six times this season, and has made a most careful and accurate calculation as to the cost and result.

Paying for a man's time 10 cents, for a boy's 5 cents and for a horse 5 cents per hour. For copper sulphate 6 cents per pound, for lime one-half cent per pound, and for Paris green 16 cents per pound, he has found the cost of the six applications to be 11.43 cents per tree, or one cent and nine mills for a single application.

The chief item of expense is labor, which amounts to two-thirds of the total cost. Without labor six applications cost 4.14 cents per tree, or rather less than seven mills per tree for a single application.

The experiments were made in an orchard of 400 trees ; 125 of which were twenty-nine years old, and 275 of which were eighteen years old.

The result of spraying the orchard of W. H. Heard six times during 1896, cost as above, was as follows :

Name.	Total.	1st quality.	Of firsts.	2nd and 3rd.	Of 2nd & 3rd.
	Bbls.	Bbls.	Per cent.	Bbls.	Per cent.
Greenings	236	216	91.53	20	8.47
Kings	73½	66	89.80	7½	10.20
Baldwin's	118½	111	93.68	7½	6.32
Ripson Pippin	7½	6	80.00	1½	20.
Twenty-Ounce Pippin	22	21	95.46	1	4.54
Blenheim	48	42	87.50	6	12.50
Wealthy	16	15	93.75	1	6.25
Snow	25½	24	94.22	1½	5 88
Spys	19½	18	92.31	1½	7.69
Grimes' Golden	32	27	84.38	5	15.62
Romanite	13	9	69.24	4	30.76
Wagner	27	21	77.78	6	22.22
Russett	140	120	85.72	20	14.28
Total	778½	696	Av. 89.5 %	Av. 82½	Av. 10 5 %

Although the price of apples has been low this year, it is no time to be discouraged. Science is coming to our aid, enabling us to control the natural enemies of our fruit. Year by year our fruit is taking a higher stand in the European markets, also in Chicago and the western and southern States they no doubt will eventually become large consumers of our apples, and we are likely at an early date to have a system of cold storage by which we will be able to hold our fruit safely and cheaply until a favorable time for disposing of it. This, together with provision for its shipment by rail and boat in cold storage to England and other distant markets, will materially assist the fruit grower in disposing of his fruit advantageously.

This has been the people's year, a year of advertising. Fruits of all kinds have been abundant, we may not have as large a crop again for a decade. Good clean fruit properly handled has brought fair prices in the English market this year, when it was consigned to honest dealers.

But, unfortunately, the curse pronounced upon man for sin is not the only one or the greatest that the fruit grower labors under, and has to contend with. Express and freight rates are too high, and the careless handling of fruit in transit has rendered many valuable consignments almost worthless. But towering over and above all the rest is the dishonest commission merchant who fails to make honest returns, and at a favorable time for himself fails altogether, but does not fail to lay aside for himself the mammon of unrighteousness, and at the beginning of another fruit season he bobs serenely up, scatters his cards and his smiles broadcast, and is ready for another season's plundering of fruit growers. The loss to growers from this source is great, and there is no remedy in sight. Cursing, which is freely and frequently applied, does not cure them, and spraying would not kill them, burning is the only cure and that cannot be applied in time to help the fruit grower.

Mr. HUGGARD: Have you found any evil results from the Bordeaux mixture in spotting the apples that otherwise would have been clean?

Mr. ORR: I have not seen anything or heard of such.

Mr. HUGGARD: I have a tree of Swaar apples and another of Baldwin, both of which were rusted some, and the apples to considerable extent, not injuring the fruit or the productiveness of the tree at all, but rather injuring the outside coating as a perfect apple. My attention was drawn to it by a discussion that took place on this subject in the State of Missouri, showing that the Bordeaux mixture if it was too strong with copperas and not enough lime was liable to affect the skin of the apple or spoil the beautiful glossy effects that the apple produces.

Mr. ORR: I think your statement would probably be correct if the mixture was applied too strong, but we do not apply it too strong. Last year there was a great deal of that rusting on both the apple and the pear, but I have not seen any results of it in our orchards, and we have been spraying for fourteen years. Do I understand that all the trees sprayed were affected?

Mr. HUGGARD: No, only two or three.

Mr. ORR: Perhaps you got it on too strong on those trees.

Mr. PATTISON: Is there any danger to the eyes in the use of this copper sulphate? A case came under my notice in which a young man has almost lost the use of his eyes, it is claimed, from using this copper sulphate.

Mr. ORR: I have not heard any complaints. I think that a sprayer should be careful and get on the windward side of the tree as much as possible, and avoid getting spray in his eyes. I fancy it is the Paris green that does the principal harm. More than that, I think the horse ought to be covered. I have heard of it being injurious to horses where the spray fell on them to any extent. Some old blanket can be thrown over them, and save both horse and harness from the material.

Prof. SAUNDERS: I think it is important that every hint from every quarter in regard to marketing the large quantities of fruit now being grown should be ventilated, so that fruit growers may govern themselves accordingly. A few weeks ago, when I was

in Winnipeg, there was a great glut of grapes pushed in there from Ontario, and the larger dealers universally complained of sending grapes in baskets, as far as Winnipeg was concerned. They said they rarely ever got there in good condition. I would suggest that packagas be used similar to those that are sent from California. The price realized from them would be very much larger. I saw some of these baskets of fruit which had been subjected to the jolting for 1,400 miles in a fruit car, and they were not at all in a good condition; they were mussed up and berries more or less broken, and altogether different from the fruit that comes into the Ontario market from California, a much larger distance, packed in a different way. I have no doubt that the ingenuity of fruit growers will soon devise means for overcoming these obstacles, but some attention should be paid to it next year by the Association or by some fruit growers, so that the package might be varied to suit the market.

The SECRETARY: Did Mr. Orr use the Bordeaux mixture all summer?

Mr. ORR: Yes.

The SECRETARY: In a season like this it would not have been necessary to use much more than Paris green, because there was no fungus.

Mr. ORR: In some sections there was not, but in others there was considerable.

Mr. CASTON: In 1895 I used the Bordeaux mixture according to the formula given in the bulletins issued by the Experimental Farm, and by the stations on the other side, and to insure making it right I used cyanide of potassium itself. There was a long spell of dry weather, and during that time the trees were continually covered with the Bordeaux mixture, and the leaves of the Russett trees were dry and fell off, while those on the Spy were not affected at all. Did you notice any injury to any particular varieties? It seems to me that some varieties are more liable to injury in the foliage than others.

Mr. ORR: The men who did the spraying kept an accurate account of the foliage at each of the six sprayings. We have not a case reported but was in favor of spraying—no intimation of any damage being done to the foliage on any of the trees.

Mr. M. PETTIT: Does. I don't understand whether what Mr. Orr calls "clean" in his percentages simply cover the apples that are clean from the fungus, or the codling moth.

Mr. ORR: Both from the fungus and codling moth—perfectly clean, sound apples.

Mr. PETTIT: That does not prove to us yet that spraying has destroyed the codling moth. While I am free to admit from my own experience there is no difficulty in keeping the fungus in check, I cannot say that I have ever seen very great results in destroying the codling moth.

Mr. ORR: In Mr. Pay's orchard at St. Catharines the principal loss was from codling moth. Over one-half of his apples were affected by the moth in the part not sprayed; in the other there were about twelve per cent.

Mr. CASTON: Entomologists tell us that the egg of the codling moth will hatch out in about eight days, so it is very important to get the spraying on the end of the young apple during that time, and unless it gets poisoned when it begins to bore into the apple it is no use at all. I think the greatest damage is from the second brood.

Mr. PATTISON (Grimsby): I believe most of the damage is done by the second brood, and I think for the second brood the spraying has no effect at all. The season before last, having some leisure time in August, and my apple crop being remarkably clean up till that time, I took the trouble to spray thoroughly with Paris green about the 12th or 13th of August, having observed the second brood beginning to work. I examined the trees afterwards for some time and found that the Paris green had produced almost no effect whatever on the codling moth at that time; but I think it does produce a very considerable effect just after the blossoms are set upon the first crop. I think that it considerably reduced the number of insects available for producing a second crop, and in that way does a lot of good, but I do not think it has any effect at all upon the second crop when it is sprayed directly on these insects.

Mr. CASTON: Is there any mixture that will be so disagreeable as to keep those insects away?

Prof. SAUNDERS: I think not. Insects will stand almost anything in the way of disagreeable odors or anything of that sort as long as they are not poisoned. They persist generally in carrying out their office for which they have been designed in nature, and the only way to overcome them is to kill them. A great many of such devices have been tried at different times without much result.

Mr. HUGGARD: I think one application of the Bordeaux mixture previous to the buds expanding is of more value than any two you might apply afterwards. We make a point of spraying—I don't do it by way of experiment particularly, for I have so much faith in spraying the trees abundantly and effectually that I don't leave a bud in my apples but what is sprayed several times per annum, some four times and some three—and I did not see any perceptible difference when I sprayed after the blossoms had fallen and once before than I did when I sprayed three times after the blossoms fell. Out of some two hundred barrels of apples that we grew this year there was not half a barrel of wormy apples all told, and no scab whatever.

Mr. ORR: I would like to ask Prof. Saunders to give us some information in reference to the second brood of the codling moth and their treatment.

Prof. SAUNDERS: You mean as to the dates?

Mr. ORR: Yes.

Prof. SAUNDERS: I cannot give these just from memory, but the second brood vary somewhat in their habits from what the first brood do, that is in the position in which the eggs are deposited. It is not always that they are deposited in the calyx end of the fruit. I think it is the case with the first brood. The spray falls more or less into this calyx, and the egg being deposited there and hatched in that calyx the young larvæ that issues from the egg has to eat his way through the skin and in that way eats part of the Paris green, and that destroys it. In the second brood the eggs are laid on the side of the fruit, and it is not so easy to cover, and the second brood is not so easy to manage on that account. We find more complaints about injury from the second brood, as a rule, from year to year, than we do from the first brood. Indeed, as Mr. Pattison has remarked, the first brood is not a matter of so much account because the apples that are affected usually fall from the tree when they are only partially grown. It is the second brood that does most of the mischief, but I think that Paris green should be used at least with the second application of the solution, and possibly with the third application, in order to overcome the injury that might afterwards result from the second brood. The dates have been carefully worked out, but that branch has not come under my attention for the last ten years, and I am not able to carry the exact particulars in my memory.

SMALL FRUITS.

By MR. J. L. HAYCOCK, M.P.P.

It is with a great deal of diffidence that I undertake to read anything before the gentlemen who are present here from the western part of the Province of Ontario. In this section of the country we are not so favorably situated for the growth of fruits as they are in the west, and consequently our progress has been somewhat limited as compared with theirs. After travelling through parts of Western Ontario, notably through the Niagara district and through the Counties of Essex, Kent and Elgin, and seeing the extent to which fruit growing has been carried on in that section, it makes me feel almost as though I do not want to say anything with regard to fruit growing in the presence of the gentlemen who come from that section. However, we have here to-day a number of farmers from the County of Frontenac, and we find in various parts of the country that the methods of cultivation and the varieties in cultivation that are suitable in one

section are not suitable in another, so that my remarks relate to my experience in this immediate vicinity and are more applicable to this section than perhaps to the Province as a whole, but the paper I shall read contains simply some boiled-down conclusions that I have arrived at after a limited experience in growing small fruits.

It is not necessary to dwell at any length on the importance of the growth of small fruits—at the present time nearly everybody uses more or less—and the consumption is increasing very rapidly. The most important reasons for the increased consumption are, no doubt, first, the lower price of sugar, and second, the improved methods of home preservation. Many of us can remember the days when everything was preserved by the "lb. to lb." method, and when sugar was sold at from 10 to 12 cents per lb. "Making preserves" was a very expensive process and a luxury only to be indulged in by the wealthy. But to-day by the invention of "self-sealing" jars, the fruit can be kept in a more natural and wholesome condition by the use of about $\frac{1}{4}$ the quantity of sugar then required, and then the decreased cost of sugar to less than one-half the former price, makes it possible to preserve eight or ten times the quantity of fruit for the same amount of money as formerly, thus bringing its use within the reach of all classes—sugar used per capita in 1868 was 19.77 lbs.; in 1892 it was 70.50 lbs. The increased consumption of canned fruits has, no doubt, to a very marked extent decreased the local demand for winter apples. No housewife is likely to pay fancy prices for apples so long as she has a good supply of canned fruits of various kinds in her cellar.

A continuation of the low price of sugar and a reduction of the duty on glass jars, would, no doubt, result in a still further increase in the demand for small fruits.

The best location for the growth of small fruits is in the immediate vicinity of a large town or a canning factory. This, however, is not of so much importance as formerly, as, on account of the increased facilities and improved system of transportation, the leading markets are now within the reach of nearly the whole province.

Regarding soil, it is safe to say that any soil that will produce a first-class crop of corn will with proper cultivation produce profitable crops of currants, gooseberries, raspberries and strawberries.

In preparing the ground for a plantation the land should be clean and well fertilized. This is more particularly true with regard to currants, gooseberries and raspberries than with strawberries, as the plantation will last longer and it is very difficult to apply fertilizers after the bushes are set.

One of the best, if not the best, manures that can be applied is unleached ashes. The bushes should be set not less than six feet each way. The first year a row of carrots, mangels or beans may be grown between each row. The best varieties of gooseberries I find for this section is "Downing's," of black currants, "Black Naples," of red currants, "London Red," of white, "White Grape." Of red raspberries "Cuthbert" and "Shaffer's Colossal" are the hardiest and most profitable. Of strawberries the old reliable "Wilson" seems to give as general satisfaction as any.

Now there may be many other varieties very much better than any of these, but my advice would be to go slow with *miraculous* varieties, and thoroughly test on a small scale before planting largely of any new varieties, no matter how highly they may be recommended nor how prolific they may have proven in some other section of the country. Of course it is absolutely necessary to prune raspberries—at least to cut out the old wood and cut back the new; but it is a question whether it pays to trim currants and gooseberries. It is thought by some that it is cheaper and pays better in the end to set a new plantation every five or six years than to expend time and labor pruning an old one. One thing is certain, you will get a much better sample of fruit from young thrifty bushes than from older plants.

Growers of red and white currants and gooseberries will find an enemy in what is commonly known as the "currant worm." These, however, are easily destroyed if proper means are taken. After twenty years of careful observation I find that the currant worm

hatches out just about the time wild plum trees are in full bloom. It appears to take about the same amount of heat and moisture to develop the worm as it does to develop the bud into a blossom. If on the first appearance of wild plum blossoms the currant and gooseberry bushes are examined carefully, there will be found near the centre a few leaves perforated with a number of holes about the size of a pin. On examining the under side of these leaves the worms will be found about an eighth of an inch in length. At this stage they are much more easily killed than later on. A mixture of $\frac{1}{3}$ hellebore and $\frac{2}{3}$ sulphur applied dry with a sulphur bellows while the dew is on the bushes will be found effectual. This preparation not only destroys the worm, but seems to destroy all fungous growth, thus preventing mildew on gooseberries.

There are usually two broods of these worms in a season, the second one appearing just about the time the fruit is maturing. Many neglect their bushes at this period, some through fear of injuring the fruit and others who think that, now that the fruit is about matured, it will not hurt the bushes if the leaves are taken off. This is a sad mistake. The blossom buds for the next year's crop are formed during the month of September, and if the worms are allowed to strip the bushes in July, the sap of the bush, instead of developing fruit-bud, will be exhausted in forming a new set of leaves. On bushes treated in this way very little if any fruit need be looked for the following year.

Let me say a few words with regard to the importance of growing small fruits in the vicinity of Kingston. After making careful enquiry and after an observation of many years I find we do not grow enough small fruits here to supply the local demands of the citizens of Kingston. Last year after making as careful an estimate as possible I found that we imported into this city from outside growers, that is from Prince Edward county and points from twenty-five to forty miles away from here, small fruits amounting in the neighborhood of 200,000 or 300,000 quarts representing a value of from $15,000 to $20,000. Now every quart of that fruit should have been grown and every dollar of that money kept within a radius of twenty miles of this city. We have a soil as suitable as there is in any other section; we have the intelligence, and we have the market here at our own door, and there is no reason why every bit of that fruit that is imported and sold on the market in this city should not have been produced within a ten or fifteen miles radius. Our growers have the soil and intellect and the industry and everything necessary except the enterprise and the knowledge of the growth. I hope they will supply themselves with the knowledge and bring into use the enterprise necessary to produce all the fruit necessary for local supply. This would be a benefit in more ways than one. All the money paid for fruit imported is expended in other towns and cities, while every dollar's worth that is grown in the immediate vicinity of Kingston and the money handed over to those living in this locality who do their business in this city would be expended here. Now I am very pleased that the Fruit Growers' Association have come to this section, and to see so many residents of our locality present, and I am sure if the Association should visit us again they would find a larger turn-out than we have at present. (Applause)

The PRESIDENT: I am very glad that our meeting has awakened such an interest in small fruit growing in this vicinity and will probably bring about the result that Mr. Haycock desires, that the local market shall be in a great measure supplied at home, although I fear it will so greatly add to the woes of some of our western friends as expressed here, that they may even condemn us as a society. However, I think these things will all work out for good in the end. We should be glad to hear experience of local men and others on this subject.

Mr. HUTT: I wish to take exception to Mr. Haycock's remarks as to pruning currants and gooseberries. I think there is no doubt in the minds of those who are growing those fruits that it does pay to prune them. No doubt it would pay the nursery men if we could plant out a new lot every five years, but I don't think it would pay the grower. He rightly says you get better fruit on the young bushes than you do on the old. You certainly would if they are not pruned, but if you prune carefully and have new wood coming on you would get better results with old bushes and probably more fruit than

with young bushes. Our plan of pruning is to start with the young bush and leave about six branches to form the bush, and then we carry on a sort of renewal pruning on that. Every year we cut out two of the oldest branches and let two of the stronger branches coming up take their place so that we always have young and thrifty bearing wood that would give large fruit.

Mr. PATTISON: What time of the year do you do that?

Mr. HUTT: We usually prune them in the spring. Of course it may be done in the fall.

Mr. CASTON: Does the one estimate apply equally to red and blackberries.

Mr. HUTT: It is better to simplify the matter to say yes, although probably when you come to grow them you will soon find out for yourself that the black will not answer with the same pruning as the red. You want the strong young shoots of the black kept renewed to get good fruit.

Mr. FISHER: What about pruning red currants; is it not necessary to cut red currants back?

Mr. HUTT: The system often adopted is to shorten it back about one-third or one-half. You get a nicer shaped bush that way to work around; and still others recommend, instead of letting new wood come out, to keep cutting it all back and grow about six long canes. In this way you can pick in one-half the time.

Mr. FISHER (Burlington): I have found it necessary to cut red currants back. One reason is that after the branches are allowed to grow long the weight of the crop will bring them down to the ground and the fruit will be covered with soil in case of storm, and another reason is that if these shrubs are stiff, the weight of the crop being so far from the point of junction with the main stock, these long branches are broken off.

A. M. SMITH (St. Catharines): I understood Mr. Haycock to say that any soil that was adapted to corn growing would be suitable for small fruit, but I think there is a good deal of low ground that is high enough for corn growing and would produce usually a good crop of corn, that would not be at all adapted to small fruits on account of being too wet in winter. Fruit plants, like human plants, do not like wet feet.

The SECRETARY: I would like to corroborate Mr. Hutt as to the lengthening of the currant's productiveness by cutting the bushes well back and cutting out the shoots, and encouraging the growth of young suckers from the roots. I have a plantation that has been out for twenty years, and is just as productive as ever because of this method of treatment, so I think we can prolong the productiveness and the profit of a plantation of currants in that way almost indefinitely.

Mr. WHYTE: I would put the London Red at the bottom of the list as the poorest currant that grows in the country. If we are going as a Society to advise the cultivation of any particular kind of fruit it should be a good one. Anyone that has had experience with Fay or Wilder or Moore's Ruby will admit it is very inferior fruit. It is small, it is very acid, almost acrid; it is a good bearer, but no better than either of those I have mentioned. With regard to the application of hellebore, it seems to me a great waste of time and money to apply hellebore at all in the spring; Paris green is so much cheaper and efficacious and perfectly safe at that time of the year that it is not worth while to apply hellebore. The application of Paris green about the 20th May is perfectly efficacious. For the second brood I would never think of applying the material dry. By applying it wet with a spray pump you get over your work in a quarter of the time and at about a quarter of the expense for material, so it is a great mistake to use hellebore dry under any circumstances, and either dry or wet in the spring.

The SECRETARY: I think it is the best way after the currant worm has made some expensive ravages and is rather abundant on the bushes to spray, because you must spray your whole plantation; but if you begin early, before the worm has begun to make extensive ravages you can work in the simpler and quicker way. They begin

work at the interior of the bush and there you will find those holes that indicate their ravages. If you begin early in the season you can take a tumbler with netting for the top of it, and dust the bushes with hellebore and go over your plantation much more quickly and with much less cost than if you have to draw a great quantity of water and mix a great quantity of material and go about it with a spray pump.

Mr. BEALL: I understood Mr. Haycock to say he would recommend the Downing above all other gooseberries to grow. I would like to ask if he has ever grown the Pearl or Whitesmith, or any other of the English gooseberries. If he had he would scarcely have said that the Downing was the most profitable. For some years past the Downing and even the Pearl would scarcely pay for picking where there is a very large quantity grown; this year the Whitesmith would sell for nearly three times the price of any other variety in our market at all events. In regard to spraying I must disagree entirely with our friend, Secretary Woolverton. I never spray my gooseberries and currants but once in the season, and that is when I find the first sign of the pin holes in the berries; but then I go over them thoroughly; there is not a leaf left; the spray is forced into the berries from every side, and that is all that is done for the season.

The SECRETARY: I never dust them but once.

Mr. DALY: There must be a difference in the habits of the saw fly in your neighbor hood and in ours.

Mr. HAYCOCK: I have tried the Whitesmith, and the first berry I ever tried extensively was the Smith's Improved. We find it and all others in this section of country are liable to mildew. I would not put out a plantation of Smith's Improved or any English gooseberry in this section of the country if you would give them to me. The reason why I adopt the dry system of spraying was simply to save time. I have put on hellebore with a bellows on 600 well-grown bushes before breakfast in the morning frequently, and it would take me half a day with a watering-can or a sprayer. Another reason for putting on the hellebore is that I always mixed the sulphur with it, because I believe the sulphur is a good thing to prevent fungous growth on the foliage of different kinds in a bush anyway. In regard to pruning I was not very rigid in my remarks; I said some thought that it would be better not to prune. For my part I am one of those that think it does not do to prune currants or gooseberries. My experience is that if you have got a plantation set out and growing it is very difficult to apply fertilizer to it unless you go to the labor of wheeling it in with a wheelbarrow. If you go in with a cart or wagon you are liable to break your bushes down. I therefore think that if you get a piece of ground in a high state of cultivation, put on a plantation of gooseberries or currants, run that for five or six years, you can then set out a new plantation on a new piece of land properly prepared and have them come into bearing with far less expense than to turn up your old plantation and put it into shape. I am speaking now of doing it on an economical basis, and I believe there can be more money made, when you take the cost of labor into consideration, out of currants or gooseberries that are planted alternately in patches for five or six years and then rooted out and the ground thoroughly cleaned and manured again and a new plantation put out. It is a great deal more labor to make a plantation clean and free from weeds, and on the whole I think it is more profitable to set up a new plantation every five or six years.

The PRESIDENT: Has anyone something to say on varieties?

Mr. HAYCOCK: Mr. Whyte, of Ottawa, placed the London Red last in the list. Well, I have tried the Red Cherry and I would not advise anybody, unless it was some man against whom I had some spite, to set out Red Cherry currants in this section of the country. The weight of the snow in the winter here is liable to break them down, as the Cherry currant is very brittle. The London Red may not be properly named, but the trees I got from Messrs. Leslie & Co. grow a large long bunch filling clear to the end, and when sold in the market is almost equal in size to the Cherry currant, and so far as bearing is concerned we can always get double the number of quarts off a London Red bush that we could off the Cherry. I have never had experience with Fay's Prolific.

Mr. DALY: What is Mr. Hutt's opinion about shortening the gooseberries during growing season?

Prof. HUTT: I cannot say I have had experience of that; I never thought there was anything to be gained by that.

Mr. RACE: It seems clear to me that Mr. Haycock has not got the London Red. From the description of the berry he has given us I would say it is more like the Versailles. His description does not meet the London Red at all. I have grown it, and I would not have it on the premises if I could get the Cherry or Fay's Prolific. I would even prefer Moore's Ruby. I have grown the Whitesmith for a number of years and also the Pearl, and I consider that I could get one-third more berries off the Pearl than the one he named, but in my opinion the Whitesmith is the most profitable of all the gooseberries. It is a rank grower, a heavy bearer, and can be kept clear of mildew with very little difficulty.

Mr. WHYTE: A very important consideration is the character of the soil. If there is a light sandy soil there is no use in trying gooseberries, but if you have the right kind of soil you will get more fruit from the Whitesmith than any other berry. We have very little trouble with mildew, practically none.

Mr. DALY: Of all the red currants that are grown to-day in Canada, I think Fay's Prolific heads the list. I think it is the finest quality, and it is an annual bearer, and taken on the whole, you will get better currants and better crops than from any other.

The PRESIDENT: I would like to hear from Prof. Craig.

Prof. CRAIG (Ottawa): If you are going to grow for market I would not recommend Moore's Ruby or Wilder; they are fine in quality but do not produce, except possibly under the favorable circumstances that Mr. Whyte is able to give them in his garden, as much as other varieties such as Cherry or Grape. That is my experience. With regard to black currants, we have one or two saplings that have been fruiting for one of two years, that are more attractive than any named varieties that we have on trial. We hope in the near future to have these sufficiently decided so as to give some plants to the Association. One of these has already been sent out and favorably reported on by Mr. Young, of Cornwall, in the Horticulturist under the name "Success." Mr. Young happened to recommend the variety when he was visiting the farm some time ago, and to call the attention to the fact that he had a plant, but did not know where it had come from, and I found it came to him by way of the Society from the Experimental Farm. My experience coincides with what has been given, that the Pearl heads the list of American varieties for productiveness, and general vigor of plant and as a commercial variety. With regard to the European sorts, of which we might take the Whitesmith as a type, we should plant them with our minds made up that they need special conditions. In the first place if we are not prepared to spray them perseveringly, and every year we need not plant them; and in the second place they require a clay soil, not wet, but still rather damp, and I find that they do best if you can so arrange your plantation as to give them partial shade. Our hot eastern and Ontario suns here induce a powdery mildew that attacks the fruit; still if one has right conditions and is near a good market I would recommend him planting the Whitesmith, and Keepsake is another variety that has done well with us.

Mr. MORRIS (Welland): Mr. Haycock, I dare say, would like to have a tariff against outsiders coming into Kingston. As it is impossible for him to have that he gives advice that points in that way—recommends a poor kind of currant; but I believe that he is rather honest in that after all, because I believe the currant he speaks of is not the London Red. From his description of it it is the Prince Albert. (Laughter). I think he is certainly wrong in not trimming his bushes, for even if he renews every five or six years it is a great deal of trouble to dig out the bushes. One of the best fertilizers for currants is the muck out of swamps. Put it in the ground in the fall or winter season and it will give you great satisfaction.

REPORT OF COMMITTEE ON SCORE CARDS.

The following report of Committee on Score Cards, was presented by Mr. T. H. RACE :

Your committee met at the office of the secretary, and after carefully considering the whole matter concluded that the cards first proposed were too cumbersome, and that a simpler form would be more practicable. The following forms were agreed upon for use in collections :

SCORE CARD FOR APPLES AND PEARS.

POINTS.	VALUE.
Color	
Size	
Quality	
Commercial Value	
Total	

N. B.—Maximum of Points for each plate, 10.

SCORE CARD FOR GRAPES.

POINTS.	VALUE.
Color	
Size of Bunch and Berry	
Form of Bunch	
Flavor	
Total	

N. B.—Maximum of Points for each Plate, 10.

The committee recommend that this card be furnished the secretary's of the principal fairs for use in 1897.

Mr. RACE, for the committee, said that the board of directors thought that the score card arranged a year ago was too cumbersome hence it had been simplified as now produced (specimens distributed). As to the utility of score cards there is quite a variety of opinion. Even with this simpler form of card I find it very difficult to go over a large collection of apples at the agricultural fares, because no agricultural society would pay you for the trouble of going over their fruit list and laying these score cards upon them. The object of these cards is to judge the fruit on points—color, size, quality and commercial value. It is considerable trouble to do this, and althought it is the better way, and the only real way to arrive at a proper judgment, yet to carry out this plan the societies will have to pay the judge for the time occupied in it. Instead of using these cards at London last time I had a clerk with me who took note of my points. There were twenty-two exhibits of ten varieties for family use—one summer, one later summer, two fall, and so on spread over the whole season. The first thing I did was to run over

and see if they properly covered the season, and if they did not I ruled them out. I went over the others and called out to the clerk the points that were given by this board as published in our magazine. The highest is forty points, and they are to be judged by the color, by uniformity in size and by perfect specimen of apples. In that way I can go over a large number of collections in a very short time. Of the twenty-two varieties in London I had eight ties, so I had to go over all those in the same way. A mistake exhibitors often make is to place a large specimen apple on top, fancying that he is going to bring his specimen up in quality, but the judge has to reduce the score on account of lack of uniformity. Now, if I were to use these score cards in a matter of that kind to make them all out it would take me much longer time, and there are very few societies that are willing to pay a man for doing that. However, the score cards are before you and we wish to know what you think about them.

On motion the report was received and ordered to be printed in the annual report.

DOMINION FRUIT EXPERIMENTAL STATIONS.

The PRESIDENT proposed a discussion on the question in the question drawer "Should we have a Dominion Fruit Experimental Station in Southern Ontario; if so, for what purpose and where?"

Mr. E D. SMITH: It seeme to be very desirable that shere should be a fruit experimental station in Southern Ontario, for that is where most fruit is grown. Hitherto most of the experiments have been conducted in Northern Ontario, originally at Guelph, latterly at Ottawa, where the experiments are of very little use for growers in the southern part.

Mr. M. PETTIT thought it would be desirable if we could have one established. He supposed it would be in a manner connected with the Central Experimental Farm at Ottawa, a sort of branch for them for testing more tender fruit that they cannot succoed with there.

The PRESIDENT called upon Prof. Saunders to speak on the subject, remarking that evidently not much consideration had been given to it, mainly from the fact, he presumed, that the Ontario Government had taken up experimental work at so many different points which will cover nearly every latitude in Ontario.

Prof. SAUNDERS said: I have no suggestions to make at all. It was the suggestion of the Secretary that I should stay over and hear the discussion that might arise in connection with this subject. I may say that for the past four or five years petitions have come in mainly from different parts of the Niagara peninsula, and presented to the Minister of Agriculture requesting that a fruit station be established for the purpose of testing fruits in the Niagara peninsula, fruits that cannot be tested at Ottawa, and urging that it would be of great value to the fruit growers of that part of the country. I think myself, now that the Ontario Government has taken it up, that the ground is fairly well covered, and under the plan which has been established it admits of the testing of all varieties of fruits—of peaches, for instances, in one district most favorable for that fruit, pears in another district where pears are known to be grown with very great success, and so on through the whole series, and it does not appear that there is any special need for the establishment of a fruit station by the Dominion Government under these circumstances. As long as the fruit growers of the Niagara peninsula are satisfied with the existing arrangements there is no disposition on the part of any one at Ottawa to open up the question. I am very glad indeed to find that members of the Association are satisfied with the existing arrangements, and I hope the experimental stations conducted by the Provincial Government will be eminently successful and meet the views of the fruit growers in the different parts of the country. At Ottawa we shall be glad to do all we can to assist the experimental stations at the different points of Ontario with any scions or plants of anything we may have that it is desirable to test in those parts of the country.

Mr. SHEPPARD : I take the view that it is very necessary for us to have an experimental station in the Niagara District, because I claim that the experiments carried on by the Ontario Government do not fill the bill. As I understand, it is simply to test new fruits, but the scientific treatment and study of the diseases affecting fruits is being entirely overlooked, and I think a station that would take up this view of the subject, as well as the practical experiments of fruits, would be of great advantage. I do not think the fruit growers need so much new fruits as the cultivation of the fruits we already have, and the bringing of those fruits to perfection and saving them from the ravages of different insects and fungous diseases that are attacking them at the present time.

The PRESIDENT : I wish to correct an error into which Mr. Sheppard has fallen regarding the work of the experimental stations already established by the Provincial Government. It is not altogether for the testing of new varieties ; in fact the experimenters were chosen in most instances where they had already a good supply of the older varieties under cultivation upon which we could operate and get reports immediately. Of course as new varieties come out they were added to the collection, but in each instance in the district in which we have established an experimental station we have selected men who have taken a deep interest in the matter, who have already quite extensive orchards, and who have been able to give us, as you will see when the next report is published, valuable information and reports on the older varieties, and in some cases many new varieties of fruits. Then as regards disease, both insect and fungous, that is a matter that is under contemplation ; we intend to take it up just as fast as it is possible to do so. The spraying operations have been conducted on quite an extensive scale and much valuable information and that which has been very instructive to the fruit grower has been the result, and these we believe it is contemplated to carry out very extensively each year.

Mr. E. D. SMITH : I am sure there is no apathy on the part of the fruit growers of the Niagara peninsula in regard to these experimental stations. It is not apathy that makes us say so little about it, but it is rather the desire to give the present Ontario Fruit Experiment Stations an opportunity to show what they intend to do. We feel of course they have begun on a small scale, but we expect and fully believe that they will extend as time goes on, and that the experiments will include not only those you have mentioned but all experiments in connection with the growing of fruit. If we thought otherwise we would be up in arms at once to ask the Dominion Government or any other Government that would assist us to have an Experimental Station there, because we have felt for years past the great necessity of that, and we were so delighted when these were established that are established that we feel like letting them have a good chance to show what they can do towards filling the bill. Each fruit grower has been conducting experiments on his own plantation at an expensive rate in times past that could have been conducted a hundred times more economically at an experimental station.

Mr. ORR . I feel it very desirable indeed that we should have an Experimental Station in Southern Ontario. I am satisfied that there are many varieties of fruit that we ought to grow that ought to be tested here. When I was collecting fruit for Chicago I found figs at Niagara in a full state of perfection and picked them and sent them there. Now that was a surprise to many of us. I think we ought to have an experimental station, and I think it ought to be located somewhere about Fruitland, which is the freest from frost that I know of in the country. Our flowers were blooming there up to last week, and along the mountain side are blooming still. My vineyard has been there for over 30 years and we have never lost a crop from frost either spring or fall.

Mr. A. M. SMITH said ; I have not been present to hear the arguments advanced, still I would agree with Mr. Orr that there is a necessity for a larger work than is being done by the Ontario Government or is likely to be done for many a day. In mentioning figs he foregot to mention some other things that are perhaps not at Fruitland but in the vicinity of St. Catharines. (Laughter.) English walnuts and almonds and the like of them. That is a line that I have. The matter of nuts alone it is an important one even to the commerce of this country. (Hear, hear.) I am not in possession of the amount

imported, but it must be a very considerable amount, and I think that the Southern portion of Ontario would be able to produce large quantities of nuts such as the English walnut and filbert and perhaps some variety of almond. It has occurred to me that a fruit growing station in connection with the testing of some of the tender varieties of grains and vegetables and such products that cannot be grown in some of the cultured portions of the country might be conducted there. Those of us who are engaged in fruit growing in our section know that it is becoming a difficult matter to obtain fertilizers, and I think it would be a great help to us if we could obtain assistance in the matter of testing fertilizers, of which we shall soon need large quantities for producing fruit. I have always asked for an experimental station in the Niagara District. I am not particular where it is located—at Vineland or St. Catharines or even in Essex.

Mr. HUGGARD: Unless we purpose going into lemons and oranges and figs, etc., I do not see where another Experiment Station is going to be of any advantage to the general growing of fruits in Ontario. The number of fruits that have already been grown and tested in that district are well known, and when they get outside of that particular district we know that they will not succeed so well. I think it would be a large expense for very little profit inasmuch as a small area of our great country could possibly produce what could be produced in the Niagara peninsula, and therefore it would be only servicable for the southern portion of the Province to establish anything in the shape of tender fruits that we have already under cultivation in that district.

Mr. WHYTE (of Ottawa): I think it is notorious that our present system of experimental farms are very much hampered for the want of funds, and it would be a great mistake to fritter away any funds that are appropriated for that purpose until the present work is brought to a better state of efficiency. There is an immense amount of work that could be done at the present stations, that applies to the whole country. That work is not done as well as it would be if we had more funds. It would be an advantage to the Niagara section to establish an experimental station, but that would be of very little benefit to the whole country. I think we had better wait to see how our present system works before we think of establishing another one.

Mr. BURRELL (St. Catharines): Perhaps it is in order for me to speak, who am supposed to represent an experiment station. The Board of Control have given me to plant this year to a considerable extent apricots, nectarines, Japanese chestnuts, mulberries, and although they have not got into figs, lemons and so on there is no knowing what they may ask me to take up later on. (Laughter.) I have taken up probably a good many varieties that there will never be any money in for me, probably never any money in for anybody, because I do not think we can get into the banana trade with a great rush in Ontario (Laughter.) At the same time I feel like Mr. Smith if this thing were not to develop it is hardly worth establishing at all, and if it were not to I should be in favor of establishing an educational station at once and work for it and have it thoroughly developed; but it certainly must develop if it is to be of any value at all. We feel that we should not only test new varieties but carry on experiments with fertilizers and insect and fungous diseases to a considerable extent. I look upon fungi and insects as the most important things we have to contend with. We have done something with them already, but with the help we expect to get we should hope to go into it far more extensively in the future.

Mr. SHEPPARD: The experimenters themselves are practical fruit growers, men who are making a living out of this business, and probably have given a great deal of study to particular lines, but not to the particular scientific lines of fruit growing. In a great many cases they are not able, from their training, to take up this matter in a scientific way. I know if we want any information in our section in regard to a great many troubles we have there, we have to send down to the Experimental Farm at Ottawa to Prof. Craig or Prof. Fletcher or some of the other gentlemen there for information, while in a great many cases I know they have made trips up here. Prof. Fletcher was at my place and on my neighbor's place two or three times examining into a little borer that is troubling us with the peach trees. We have not been able to get any remedy for

that, and the trouble is we are not able to give these gentlemen the information that they require when they come. We will be asked when this borer does so and so; when we saw it and when we did not see it, and when it lays its eggs and when it hatches out. Now, what ordinary practical fruit grower can give that information to Prof. Fletcher when he asks? I cannot, and I have given this matter a good deal of attention, and I feel that there are hundreds of others that know the practical result of the borer, but cannot give the scientific information that is necessary for these gentlemen before they can deal in a practical manner with this subject. That is only one subject, and these things are very common with all fruit growers. I do not think it would be necessary to have a more expensive experimental station, but some man there devoting his whole time, some man trained for this very work. At present I do not think that we pretend to experiment in testing varieties, spraying, etc. I feel very grateful to the Government, and am quite anxious to assist the present stations to do what they can do, but I do not think they fill the bill.

Hon. Mr. FISHER: Perhaps it is not quite right that I should take part in such a discussion as this, but I confess that the tenor of it has been of the greatest value to me and will be in guiding me in the future. There are just one or two points to which I would like to draw the attention of those who have taken part in this discussion. In the first place, the request is for a station at a particular locality for a particular purpose. I may say that in addition to the demands from that section for a particular station there are large numbers of other demands from other parts of the country for other purposes just similar to this. The other day, the Nova Scotia fruit growers earnestly demanded that I should have an experimental station there for fruit growing, and so on. I have no doubt that in a very short time other demands of a similar nature will be received from other parts of the country, and it certainly would be the case were this demand to be seriously entertained. I therefore wish to point out in the first place that the present votes for the purpose of carrying on experimental farms would not be sufficient to add this serious undertaking, because though Mr. Sheppard said it would be a very small one in this particular instance, it will immediately develop into a very large one when you take into consideration the other parts of the country whose demands would have to be met. The Department of Agriculture at Ottawa is the Department which has charge not only of the Province of Ontario and of the Niagara Peninsula, but of the whole Dominion, and if we established a branch experimental station in the Niagara peninsula we would find it very difficult indeed to refuse other sections of the country similar branch experimental stations. So far the demand for such branch stations has not been great, but I confess that I should be loth to start out on such a journey with very little knowledge of where it was going to lead me to. Further, I would like to point out that while the Dominion Government is doing a certain work and the Ontario Government is doing a certain work, the money that goes to pay for that work all comes out of the pockets of the people; it matters very little whether it goes through the hands of the Dominion Government or the Ontario Government; and it seems to me very unfortunate indeed that the same kind of work should be paid for twice over, and that experiments should be carried on twice over by two sets of people but all paid for by the same people. I think the people of the country would rebel against that, and that they would say that it was unbusinesslike and an unpractical way of conducting the affairs of the country—not the particular affairs of the Government at Ottawa, not the particular affairs of the Government of Ontario, but the affairs of the people of Canada, which is really what the Governments at Toronto and Ottawa are trying to do. If we multiply our stations it means that the people of the country are going to have to pay in many instances for double work being done at two different places. I think it would be unfortunate that the powers at Ottawa and Toronto would be overlapping one another in the fields which they undertook to do, and knowing Mr. Dryden as well as I do I think there is no danger whatever but that he and myself, as far as matters connected with Ontario are concerned, can come to a thorough understanding as to what work each of us will be able to do to the best advantage of the people of Ontario. As to experiments in fertilizers, it seems to me they would be just as valuable for the

people in St. Catharines or in the Niagara peninsula if conducted at Ottawa as they would be if conducted in the Niagara District itself. Wherever fertilizers are tested there is almost a certain amount of result due to the particular land on which they are tested, and we know perfectly well that the fertilizer which will succeed well on one farm may not succeed on the farm immediately adjoining it, let alone in a different country or a different section of the country, and the result of fertilizers in any place are not absolutely sure in regard to any other place; but I am satisfied that the results of tests of fertilizers on the four or five Dominion experimental farms which are now being carried on will give a fairly good idea of the value of the various fertilizers that are tested. I wish to point out that the tests of fertilizers on the Dominion experimental farms have been conducted now for a series of years and are of great value in regard to all the fertilizers that are on the market at the present time in this country. I just wished to express these views, although I feel already by the expression of members who have spoken that these matters have evidently received some attention and I do not fear at all that unreasonable demands will be made upon my Department. (Applause.)

The SECRETARY read a letter from Senator Sanford and said that he hoped that we would have had time to discuss the question the Senator had introduced as to the establishment of a Canadian fruit depot in England. If, after providing cold storage and transportation, carefully inspected stock could be placed in a depot in London, England, and sold there, it would be the greatest advertisement for Canadian fruit that could be possible and would serve to create a demand for the stock which might be forwarded in other ways by this country to Great Britain.

Mr. M. PETTIT: Would it be out of order to refer that subject to the committee appointed to confer with the Hon. Minister in regard to the subject of cold storage.

The PRESIDENT: I think that the suggestion is very good, and that the matter might be referred to that committee.

ORCHARD COVER CROPS.

BY JOHN CRAIG, HORTICULTURIST, CENTRAL EXPERIMENTAL FARM, OTTAWA.

Suitable cover crops to protect orchards are of great importance in all fruit growing sections. In northern regions, the practice of sowing a crop after cultivation ceases that will at once enrich the soil and protect the feeding roots of the trees is one of the essentials towards success and an item in the annual programme of orchard management that should never be omitted. The late P. C. Dempsey, of Trenton, recognized the truth of these statements years ago, and frequently expressed himself to the effect that a cover crop of weeds in the autumn was far better, considered in the light of what was best for the trees, than no cover crop at all. The healthy and profitable orchard of apples and pears which he left and now managed by his worthy son W. H. Dempsey, of Trenton, furnishes ample proof of the benefits of the system.

What the meaning of Cover Crop is.—In brief, it means sowing in an orchard after cultivation ceases in summer, such a crop that will protect the roots of the trees by preventing at once alternating freezing and thawing and deep freezing and thus mitigating the injurious effect arising therefrom; that will add something—the more the better—to the fertility of the soil when turned under; that will improve its tilth or mechanical condition; and lastly, that will occupy the ground to the exclusion of such plants as may wander out of place--weeds, When soils, especially those of a clayey nature, are

constantly cultivated without being subjected to the ameliorating influences induced by producing some kind of vegetation, not only do they become mechanically unfitted for the production of healthy and vigorous plant growth, but the food which they contain may take on forms not readily assimilable to plants. In northern sections, perhaps the strongest reason that can be urged in favour of the practice is the protective influences cover crops exert against the often severe root injury wrought by sharp frosts to trees growing upon bare soil. Speaking of injury of this kind, Professor Hartig says :—

"Roots of all young trees, even forest trees, may be killed if severe and long continued frost finds the lighter classes of soil unprotected by snow or any other covering. The periderm of the roots is thinner than on the stems and consequently the former are less protected and, moreover, growth is active for a longer period in roots, when, in mild climates, it continues till the middle of winter, so that when frost occurs the tissues are not in the inert condition which assists them to resist cold. Such plants burst their buds in spring, but wither up whenever transpiration from the delicate young shoots has exhausted the stock of water." An occurrence of this kind may wipe out in a single winter what was a promising young orchard. As the trees grow older and become deeper rooted, the danger naturally lessens. Certain portions of the Central Experimental Farm cherry and apple orchards upon light soils under clean cultivation were almost totally destroyed in this way last winter. The temperature fell and remained at or about 20 degrees below zero for some days towards the end of December when the ground was entirely unprotected by snow. The cherries were mainly root grafted or budded on Mahaleb stock, the apples were budded and grafted on French crab stock. The character or variety of stock seemed to have less to do with the extent of the injury than the nature of the soil. In those portions of the orchard where a hard and impervious sub-soil approaches the surface the injury was greatest. The twigs and branches retained their plumpness till the commencement of vegetative process ; the flower buds, with which the trees were thickly covered, opened or partly opened, as the case might be, and in some instances fruit set ; the leaf buds usually made an attempt to do their duty, but failed to more than half develop leaves. By this time the twigs were much shrivelled, and the store of food having become exhausted the trees gave up the struggle and died. On digging them up, it was found that in nearly every instance the upper system of roots was entirely killed, and while the lower or tap roots were alive towards their lower extremities, the superior portions were entirely killed. A lesson of this kind need only be learned once, and strongly emphasizes the desirability—if not necessity—of protection from that standpoint.

Cover Crops Tried.—In 1895 a number of plants were tried with a view of ascertaining some facts regarding the advantages of each in this climate. Half an acre each of the following fodder plants were sown on with a light seeding of rye at the rate of one and a quarter bushels per acre.

No. 1 Crimson Clover	20 lbs. per acre.
No. 2 Mammoth Clover	12 lbs. per acre.
No. 3 Alsike Clover	12 lbs. per acre.
No. 4 Alfalfa	15 lbs. per acre.
No. 5 Common Red Clover	12 lbs. per acre.
No. 6 White Clover and Orchard Grass	
No. 7 Common Clover and Orchard Grass	
No. 8 Pease	2 bushels per acre.

The following notes show the condition of these late in the autumn and early in the spring :

Plant.	Condition.		Remarks.
	Fall, 1895.	Spring, 1896.	
1. Crimson Clover	2 to 4 ins. high ; smothered by rye ; light covering by first frost.	Entirely killed out ; no plants to be seen May 12th.	Smothered by rye.
2. Mammoth Red Clover	2 to 3 ins. high ; weakly ; ground fairly covered by rye.	Light cover ; best where unprotected by rye.	Fairly good.
3. Alsike Clover	2 ins. ; very light covering ; poor catch.	Wintered well ; fair cover where alone.	Fairly good.
4. Alfalfa	6 to 8 ins. ; good catch, showing well through rye ; tops killed by first black frost.	Wintered well on low ground ; killed out on knolls.	Good.
5. Common Red Clover	Very weak ; nearly crowded out by rye.	Badly killed ; very light cover ; patchy.	Too weak.
6. White Clover and Orchard Grass	No improvement over last.	Killed out	Too weak.
7. Alsike Clover and Orchard Grass	Better than last ; cover light but fairly even.	Light crop on low ground.	Too weak.
8. Crimson Clover and Orchard Grass	Crimson Clover weak ; Orchard makes good showing.	No clover ; Orchard Grass makes some show.	Too weak.
9. Field Pease	Nearly crowded out by rye.	Only rye left	Smothered by rye.

Summing up the conclusions, I would say, 1) Rye sown at the rate of one and a quarter bushels per acre proved too heavy a seeding for most of the clovers and prevented their full development ; at the same time it furnished a certain amount of protection. (2) The seeding down took place about one month too late to secure the best results in the locality of Ottawa (3) The best cover obtained was given by (*a*) alfalfa, (*b*) mammoth red clover, (*c*) alsike clover and orchard grass.

Cover Crops Tried, 1896 : Upon the same piece of orchard soil as that used in 1895, one acre each of the following crops were sown on July 13th, 1896. These were seeded alone and were lightly harrowed and rolled :

Crimson Clover.....20 lbs. per acre.
Mammoth Clover.....15 lbs. " "
Alfalfa Clover.....15 lbs. " "
Common Red.....12 lbs. " "
Soja Beans.....60 lbs. " "
Cow Peas..... 2 bushels per acre.

Crimson Clover : Appeared in five days, even, fairly strong. August 12th, three inches high, covering ground fairly well ; strongest in partial shade. October 14th, strongest plants fifteen to eighteen inches. On lighter and poorer parts plants rather weak.

Mammoth Clover : Appeared rather sparsely in six days, August 12th, growth moderate, weeds principally "purslane." Taking possession October 14th. Strong, even growth throughout ; average twelve inches high, giving a close, heavy covering.

Alfalfa: Came up in five days, remarkably even and strong catch. August 12th, eight to ten inches high, completely covering the ground. October 14th, knee high, very uniform. Growth, strong, even on light sand.

Common Red: Appeared unevenly in six or seven days. August 12th, two to three inches high; ground partially covered. October 14th, six to ten inches high; rather thin here and there. Not heavy enough.

Soja Beans: Appeared promptly and evenly in five days. August 12th, plants eight to twelve inches high, vigorous. October 14th, quite black and leafless; killed by first frost; ground practically unprotected.

Cow Peas: Germinated evenly in five or six days. About right as to quantity; making strong growth. August 12th, plants ten to twelve inches high, nearly shading ground. October 14th, exactly the same condition as soja beans.

The information to be gained by the condition which the different crops came through this winter is necessary in order to arrive at satisfactory conclusions. From present appearances, the mammoth clover seems to furnish a cover which, if not ideal, yet appears to be such as to place it among the most useful of the available plants for this purpose. Alfalfa has certainly done well and I believe could be used with advantage on sandy or gravelly soils. Crimson clover grows rapidly and forms an excellent cover, but our experience shows that it is unreliable, and this experience is corroborated by that of the best fruit growers in the oldest portions of Ontario. As for cow pease and soja beans, they are not equal in the colder sections for cover crop purposes to common field pease,

Why Plants belonging to the Pea and Bean Family should be used: A deep rooting plant, with a leafy habit of growth, owing to the necessities of the case is desirable. Also a plant that will add to the fertility of the soil when turned under. The beneficial effects of green manuring is clearly explained by the chemist of the Experimental Farms in the following language, (Report 1895, page 210):

"By the acid exuded from the rootlets, by the carbonic acid of the atmosphere, and by other means, plants are enabled to make use of much of the mineral matter of the soil. This is stored within their tissues, together with water and organic matter, the latter being derived in the gaseous form from the atmosphere, and elaborated by the leaves. The turning under of a green crop, therefore, supplies for succeeding crops a store of readily digested plant food—of potash, phosphoric acid, and nitrogen. In addition to these essential elements of fertility, the decaying organic matter from the turned-under crops acts beneficially in conserving the soil's moisture, a most important matter for light and gravelly soils. Further, the presence of this organic matter serves to regulate the soil's temperature, and its decay brings about the solution of inert forms of plant food already present.

"Buckwheat, rye and clover are the principal crops used for green manuring. Buckwheat has been found very useful, as a growth may be obtained on comparatively poor soils, soils that in the first instance would not support a growth of clover, and undoubtedly both it and winter rye when turned while green vastly improve many soils. The legumes (clover, pease, beans, etc.), however, are still more valuable, inasmuch as they not only furnish a supply of readily digestible food obtained from the soil, but add a store of nitrogen derived from the atmosphere. It is owing to this power of atmospheric nitrogen-assimilation (which takes place by the agency of certain micro-organisms in the tubercles on the rootlets) that the legumes have been termed 'nitrogen collectors' in contradistinction to all other plants, which are classed as 'nitrogen consumers' The legumes appear to be richest in this element at the period of flowering, a fact which suggests this time as the best for ploughing under the crop. Since nitrogen is the most expensive of all plant foods, the knowledge of the amount of this element added to the soil per acre by manuring with clover, will prove of interest and value to our readers."

Michigan practice is: Crimson clover seeded with oats, middle of August, gives good results. Oats furnish protection for clover, help to catch snow. Rye not always turned under early enough in spring to prevent injury to trees.

The following table shows the calculated amount of leaves and stems of crimson, mammoth, common red and Alfalfa clovers per acre upon the surface of the ground just before the period of killing frosts in the autumn. The calculation is based upon the yield of a square yard of each variety.

Plant.	Weight, green material in lbs. per acre.	Weight of roots per acre.	Per cent. of water in green material in stems of leaves.	Per cent. of dry matter in stems and leaves.	Lbs. of nitrogen per acre estimated at .5 of green material.
Crimson Clover.....	22,234	6,201	83.	17.	111.
Alfalfa Clover.....	11,192	10,587	72.	28.	56.
Mammoth Red	13,310	7,260	79.	21.	66.
Common Red.....	9,528	5,445	76.	24.	47.

It will be seen that crimson clover gave the remarkably heavy yield of eleven tons of green material per acre. It will, however, also be noticed that the percentage of water is considerably higher in the green material of this variety than in that of any other. Calculating the nitrogen upon the basis of the total yield of green material therefore distinctly favors this variety. Among other striking points which may be noticed is the large weight of root material furnished by the Alfalfa, and the comparatively small percentage of water contained in its tissues.

There is little to be said in favor of soja beans or cow pease as cover crops for northern localities. They grow rapidly, produce a considerable amount of foliage and vine, but are cut down by the first light frosts. Apart from their office as collectors of nitrogen, they do not seem to furnish as much surface protection as buckwheat or rye, and certainly not as much as field pease.

Examining the values of the four clovers from the standpoint of the approximate amount of nitrogen returned to the soil per acre, we find by assuming that 74 pounds or two-thirds of the nitrogen in the crimson clover came from the air, at 15 cents per pound it would have a fertilizing value from this source alone of $11.20. This from the green material alone. The tops and leaves of Alfalfa would give about half that amount, but the difference would in part be made up by the relatively larger amount of root material, as well as dry matter in stems and leaves. Common red clover would yield $4.65 worth, but a slightly larger amount of root material and about one-third more dry matter in the stems and leaves. Mammoth clover would stand next to the crimson clover in value of nitrogen from the leaves and stems, with $6.60 to its credit, and slightly ahead of it in quantity of dry matter.

Alfalfa clover is a plant of slender, upright growth and does not branch much the first season if uncut. It does not, therefore, furnish as much leafy covering to the surface of the soil as is afforded by the same number of plants of mammoth clover, which stool out better and are naturally more branching in habit of growth than the upright alfalfa. This plant does very well on sandy soils and seems able to penetrate the hardest subsoils and maintain itself where crimson clover would starve.

Crimson clover will, I fear, in this locality serve only one of the ends for which it is sown, viz., that of keeping down weeds and adding to the fertility of the soil without protecting it very much during the winter. It is possible that selected strains of northern bred seed may be produced that will give plants capable of withstanding the severity of our northern winter. A desirable field for patient and painstaking work presents itself in this connection. On light and poor sandy soil this variety makes a very weak growth.

Common red: This possesses no advantage over the mammoth red in any respect, and is a weaker grower.

Mammoth: I am of the opinion that this will prove the most satisfactory cover crop for all the apple and pear growing sections. It germinates promptly, soon takes and holds possession of the ground to the exclusion of weeds; is fairly deep rooted; covers the ground with a good mat of foliage in the autumn, and begins to grow at a moderately low temperature in the spring. A block of six acres of this clover, sown July 10th, in one of the apple orchards had produced an ideal protective covering when growth ceased this autumn.

Mr. PATTISON: At the request of a neighbor I sowed crimson clover on his orchard, while warning him that I considered it was sown too late. The clover failed to stand the winter; but from other experiments I have seen in the neighborhood I think that on surface soils if sown early enough the crimson clover will do fairly well. Alfalfa has not been fairly tried. I would like to ask Prof. Craig whether crimson clover would be better sown broadcast about the beginning of August in our neighborhood, or whether he would consider it better to drill it in with oats or barley or light seeding of rye?

Prof. CRAIG: If I were anxious to return as much nitrogen to the soil as possible, I should sow crimson clover just as soon as you thought it was safe to cease cultivating your orchard—say the 1st of August, and by so doing I think if the season were at all favorable in matter of moisture you would get a good strong growth in the fall and possibly you might winter the crimson clover quite successfully. On the other hand if you were not so anxious about returning nitrogen to the soil, but wished to get a general protective crop and one that would give you some humus as well as nitrogen, then I would try the oats and crimson clover combination sown later in the season. I do not think, however, it would be safe to sow it later than the 20th of August in Ontario if you expect any kind of results at all.

Mr. MORRIS: What quantity of oats would you sow?

Prof CRAIG: About a half a bushel—very light seeding.

Mr. PATTISON: You said twenty pounds I think.

Prof. CRAIG: In the case of the combination you need not sow as much crimson clover as that; twelve pounds to the acre is quite sufficient,

Mr. PATTISON: One of the difficulties in the case of an orchard that has a heavy crop is that in many cases we find it convenient to make use of horses to take that crop out. I consider that would be a very serious objection to the growth of the clover. Would there be any way to meet that?

Prof. CRAIG: That question came up at the Michigan meeting, and those who sow the oats and crimson clover combination say they get along pretty well. Of course there was a certain amount of tramping down through the orchard while the fruit was being picked, but on the whole it did not seem to kill it out very much.

Mr. SHEPPARD, (Queenston): In the peach orchard we suffer severely from drouth. If we can get two or three rains just as the peaches begin to swell we get a much better crop. If we sow crimson clover the first of August we would have to cease cultivation at that time, and we would have that crop growing on the ground during the time that our peaches were at what you might call the most critical stage in regard to dampness. Now if we sow that crop would not we be taking very great risks in that respect?

Prof. CRAIG: That is a very important point. There is one way of getting over that difficulty: you can sow the crimson clover in drills far enough apart to cultivate with a narrow horse cultivator for a certain length of time, and afterwards you can sow oats between the drills and fill up—sow oats with your last cultivation, for instance. That is a practice that has been carried on considerably in the south where they fear drouths—sow the last crop such as oats or barley or something of that kind.

Mr. JONES, (Maitland): Could not a person sow buckwheat alone about the 20th August or the 1st September for a cover crop?

Prof. CRAIG: I am not very much of an admirer of buckwheat in the orchard, it gives you so little in return. It loosens up the soil and has good mechanical effect, but it does not give very much to the soil. It grows very rapidly, but it is cut down with the very first frost, and it is not equal to field peas in that respect.

Mr. JONES: It is the latest thing you can sow with success.

Prof. CRAIG: Except peas; peas will grow at lower temperatures.

Mr. SHEPPARD: The present Postmaster-General dropped a hint one day in my orchard that corn would cover the ground for the winter and would hold the snow and the frost. It occurs to me that I should have tried Mr. Mulock's hint and planted corn.

Prof. CRAIG: I do not know that it would be much better; I do not think it would be of any more value from a manurial standpoint than the rye. It perhaps might help to catch the snow more; it stands up more and offers more resistance, it has not such a smooth surface; but I do not see why it should be better than oats or even barley.

Mr. HUTT: Legumes add a great deal by what they take from the moisture, but still during the warm weather in summer a great deal of nitrogen compound is being constantly formed in the soil by the decomposition of vegetable matter. Now unless we have some crop going on there that will take up those nitrates a great part of them will be washed out by the heavy fall rains, and they will be carried off in drainage. Therefore some crop is wanted that will grow as late in the fall as possible and take up those nitrates in the roots and store it so that when they root down they will return again to the soil, and possibly in the spring, when they become decayed entirely, the trees are ready to take up those again. I think we can save a great deal even by the cereal crops—oats, rye and those things that grow late on in the season. Although they take no nitrogen from the atmosphere they save what is in the soil.

Mr. MORRIS: I think the objection to the corn will be that it will not grow greatly in the fall, and there is nothing that the frost will cut down as quickly as corn. You have to sow it in the middle of summer almost to get any growth at all that would be of use.

Mr. BURRELL: The suggestion that Prof. Craig thre wout about testing crimson clover grown from the seed we plant in our own neighborhood is an excellent one, if we can thereby increase the sturdinesss of the plant. I tried it in 1895, and sowed about four acres at different seasons, from the middle of July till early in September. Although the season was very favorable and they came on very well, the plants did not develop any vigor, and it practically was a failure. This year I sowed about twenty pounds to the acre on an old strawberry bed, plowed under, harrowed over well, and sowed on July 27th, then lightly harrowed in. That clover came up very thickly and thrived from the first, and early in November it was from eight to twelve inches high and a perfect mass all over the ground, so much so that I thought it was too heavy and I was not in a position to pasture it off, so I mowed part of it off and left a piece for experiment purposes to see whether it would not suffocate out by being so very heavy, by having the top killed off in winter. I would like to ask, supposing clover is killed off in the winter, and in my case where it had grown nine or ten inches in the fall, has it not already secured a valuable amount of nitrogen even if it is killed off?

Prof. CRAIG: Certainly.

Mr. BURRELL: Then I consider, even if it is winter killed, it is an exceedingly valuable crop for us to grow.

Mr. GILDERSLEEVE (Kingston): Did Mr. Craig find that Alfalfa had any advantage over the others in withdrawing from the soil phosphoric acid and potash from the sub soil and elments? Of course the nitrogen is there to a large extent, but it gets these in addition. How does that compare with other grain crops?

Prof. CRAIG: I could not say as to figures.

Mr. GILDERSLEEVE: Would it be accounted for by the extreme depths to which its roots extend?

Prof. CRAIG: Yes.

Mr. GILDERSLEEVE : I have been told that it grows so much deeper than the roots of the trees that it brings to it those elements, and that when it is turned in the trees get the benefit which they would not have done in its natural state.

Prof. CRAIG : I think one of the chief benefits is the mechanical effect it had on the soil. Whenever a root grows there is planted a little line of humus to that rooted tube, as it were, and these so thoroughly planted all over the solid have a very benfical effect. I found in our orchard, where the rock shale approached the surface, that it even penetrated the crevices, of that rock where the strata were perpendicular, and when I was digging up the roots I found them tightly glued into the little crevices of the rock. That is an illustration of its great penetrative power.

Mr. CASTON : Crimson clover is one of the most valuable things we can get hold of from the point of furnishing nitrogen to the soil. It is one of the most expensive elements of plant food. When you consider the area that is planted in this Province with fruit it stands to reason that without clover crop they are not properly fertilized—that the ordinary sources of manure are altogether inadequate. I would be pleased if we could get a variety of crimson clover that would prove sufficiently hardy for the different sections of this country.

Mr. HAY (Kingston): My orchard was planted about fifteen years, and since planting I have made a habit of plowing it every fall and banking my trees a certain height about the roots, but not in general. This last year I sowed common red clover about the middle of July and had a very fair crop all over my orchard. I let it remain there, and the result is that my Ben Davis trees are entirely dead, with very few exceptions—some small branches coming up in one or two trees. There were no other trees so affected, except some Grimes' Golden.

PROF. CRAIG : The Ben Davis in northern sections is a notoriously uncertain variety. I have known it to die after bearing three or four crops—being very healthy for seven, eight or nine years, then bearing two or three crops, and then when we got such a test season as last one, nearly twenty degrees below zero without any snow protection on the ground, the Ben Davis steals silently away nearly always. All through this section it is tender. The top governs the root not only as to the form of it and the way it grows, but probably the constitution.

Mr. HAY : I would say that they bore very heavy last year, and the fruit held on, and the foliage was very good. I attributed that largely to spraying. I sprayed for the first time last year, and sprayed it continually for six times I think. Through all the storms we had my Ben Davis stood better than any other.

PROF CRAIG : No doubt the heavy crop to some extent weakened the tree.

Mr. MORRIS : I am glad to see that Prof. Craig has come to the conclusion that the top has influence on the roots. We know that when the soil is very dry the frost goes down below the roots, those trees are very apt to winter kill. We notice that frequently in the case of peaches. The clover being sown in Mr. Hay's orchard may have taken out the moisture so that the frost would have more effect.

Mr. ORR : Twenty years ago, when I commenced the fruit business, it was my lot to get on a farm where the land was exhausted, and I commenced treating it with everything in sight—chips and leaves and fertilizer of every kind, from whatever source I could get it. I sowed buckwheat in the spring, plowed that under, and then sowed rye, and put everything I could back on it except the fruit, which I commenced very soon to get. I have great faith in rye. All you have to do is to show it the ground and it will grow. Let them come in contact and the rye is bound to grow. We can sow it at Fruitland up till the middle of November and have an excellent crop. The rye I took the award on in Chicago was sowed on the 14th November. We sowed it intending to plow under, but it just so happened that we let it remain, and it grew over six feet high. I would not like to sow corn in orchards to leave it, on account of the mice. They are very bad just about the foot of the mountain, where they have the run among the rocks and stones. I found I was losing considerable fertilizer from the winds sweeping off the leaves from the vineyard, and after some study I succeeded in trapping all those leaves, by running furrows down the vineyard, as soon as they fill with leaves I make another furrow, and so trap and save all the leaves to feed the land.

REPORT OF COMMITTEE ON RESOLUTIONS

Mr. BEALL read the report of the Committee on Resolutions, and moved its adoption, seconded by Mr. A. M. SMITH.

Moved by A. M. SMITH, seconded by Thos. BEALL, "That the thanks of this Association are justly due and are hereby heartily tendered to:

"The Mayor and corporation of this city of Kingston, and to the Kingston District Society, for their kindness in providing the necessary accomodation for the transaction of its business:—

"To the Reverend Principal Grant, of Queen's University, for so ably presiding over deliberations on Thursday evening:

"To Professors Short, Fowler and Knight also from the University, and to Prof. Ruddick of the Diary School for their excellent papers and addresses given from time to during this our annual meeting, also to the local press for excellent reports, and to the Board of Governors for the use of the Building." Carried.

Kingston, 5th December, 1896.

FRUIT AND THE TARIFF COMMISSION.

Mr. BURRELL: As most of you are aware, the tariff commissioners are going through the country to ascertain the views of the people on the tariff. The people of Hamilton have had the opportunity of appearing, and it has been thought well; that the fruit growers should officially give expression to their opinion in the matter, and I have therefore much pleasure in moving this following resolution:

Moved by Mr. BURRELL, seconded by E. D. SMITH, "That for the guidance of the committed appointed to appear before the Tariff Commission, this meeting is of opinion that the present import duties upon fruit be maintained as they are with the following changes only, viz.: the advalorem duty upon pears and plums of twenty per cent. and twenty-five per cent. respectively, be changed to specific duty of one cent per pound, and that the duty upon evaporated peaches be increased to 2 cent per pound."

Mr. RACE asked that the resolution be read again, which was done, and the resolution on being put was carried unanimously.

Mr. E. D. SMITH. I have a resolution that might fairly come from this meeting, in connection with nursery stock. It is well known that at the present time the nurserymen in the northern States are being driven to the wall and ruined by the unfair competition of nurserymen from the south. If the Tariff Commissioners should take the duty off trees as they at present exist the nurserymen of Canada would be ruined in just the same way as they are in the northern States to-day. The consequence of that would be that this country would be flooded with trees grown in the south. Now, those who are conversant at all with the growing of trees will know that a tree can be grown in the south at about half the cost of what it can here. The season is twice as long, labor costs about half, and land less than half, and if they have free entry into Canada the consequence will be to ruin Canadian nurserymen as well as in the northern States, as they have done to-day. The consequence to the fruit growers would be that instead of getting northern-grown trees, hardy and suitable for this climate, they would get almost entirely southern-grown trees. These would be bought by dealers and brought north by dealers who might perhaps make a pretence of growing northern trees and selling them to the farmers and fruit growers of Canada. There are a great many other reasons why this stock should be kept out, but that, I think, is a sufficient reason to induce every fruit grower of Canada to urge upon the Government to maintain a sufficient duty upon trees to enable the Canadian nurserymen to live. For that reason I beg to move the following resolution:

Moved By E. D. Smith, seconded by Murray Pettit, "That as it is extremely important to prevent the utter ruin of Canadian nurserymen by unfair competition of United States nurserymen—driven to sell their stock at a frightful loss by the enormous production of southern nurserymen; and as, in consequence of such ruin of Canadian nurserymen this country would be flooded by southern grown stock, which though firm in appearance is not at all suited for planting in this country—therefore this meeting is of the opinion that the present duties should be maintained.

Mr. Caston: What are the duties at present?

Mr. E D. Smith: The duties upon everything at present except apple, pear, plum, peach and cherry trees is twenty per cent. That is extremely low. The duty upon those trees is a specific duty of three cents each.

Mr. M. Pettit: I would second that motion, and in doing so would like to say that I have had some experience in purchasing nursery stock. Some years ago I purchased 600 peach trees, 300 of them from our own director, Mr. A. M. Smith, in the nursery, he was then conducting near Grimsby. The other 300 came from a nurseryman who represented himself as being from near Rochester. The 300 trees I bought at Grimsby were every one true to name and in good condition, and all lived. The 300 trees that came from the United States were very dry when I received them. They had just the same care and cultivation as the others. One hundred of them were not true to name, and in those trees I had a very large loss, though I cannot give you the number. Not only that, but in many of the 300 that came from the other side, the yellows broke out, and I lost my whole orchard just when it was in the prime—for in those days we did not know what the yellows were and did not commence to destroy it; and I firmly believe that would have been money in pocket had I paid Mr. A. M. Smith $5 apiece for another 300 trees instead of getting those 300 as I did from the other side. I have had other similar experiences, which it is not necessary to take up the time of this Association in discussing, and I believe it is in the interests of the fruit growers of this Province that the duty remains to encourage our home-grown trees, which we all know are truer to name and are better suited to our climate.

Mr. Caston: In speaking of southern-grown trees do you mean from the southern States or from Rochester?

Mr. E. D. Smith: Southern States; such as Georgia and Alabama.

Mr. Caston: Would you include Ohio?

Mr. Smith: Southern Ohio would be pretty tender. Northern Ohio would be all right.

Mr. Pattison: I would like to say a word in support of this motion. From my view of over-planting I think that this duty should decidedly be kept as it is now.

Mr. Pettit: Raise it.

Mr. Pattison: We are suffering at the present moment sufficient from the amount of trees we are induced to plant by the home nurserymen. (Laughter). I think that fruit growers have suffered very badly from varieties not being true to name, and from countless other causes; but if any rogue be encouraged at all I think it is better to encourage the home rogue than the foreign rogue—(laughter)—and on those grounds I would have much pleasure in supporting this resolution.

The motion was then put and carried unanimously.

The convention closed at 12.15 p.m.

In the afternoon the delegates were driven to the Rockwood Asylum and the Provincial Penitentiary, the workings of which institutions they inspected with interest.

The Anderson Force Pump of Aylmer, Ont., and the Spramotor of London, Ont., were on exhibition in the hall of the Dairy School during the sessions of the convention.

FRUIT AS FOOD AND MEDICINE.

By Rev. George Bell, Queen's University, Kingston.

The Fruit Growers' Association is doing much to awaken the people of Ontario to the importance of the cultivation, production and improvement of fruit, and to its value both in domestic economy, and as a factor in commercial and national wealth. By many, fruit is looked upon as a luxury, and little as an integral part of daily food, still less as a continually needed medicine. But for both food and medicine, fruit is important everywhere, and peculiarly so in this Province, first from the necessity of its use, and secondly from the comparative ease with which it can be obtained. The climate of Ontario is often spoken of as glorious, and justly so; but yet it has some peculiarities which require attention if we are to enjoy a full measure of health. The sudden changes of temperature, the rapid growth and decay of vegetation, and many consequences of the opening up and settling of a new country produce results, malarial or otherwise, which need to be guarded against. This requires attention both to a properly regulated diet and to the surrounding influences of heat, cold, dampness, purity or impurity of air, etc. While foods consist mainly of two classes of substances—flesh-forming, as meat, cheese, gluten, etc.; and heat-producing, as grains, roots, etc., having starch and sugar as constituents for perfect development and health of the human body, these are not sufficient. There have to be added substances of varied chemical composition, both to aid the assimilation of the food and to eliminate injurious substances. One series of derangements arises from influences, malarial and otherwise, which may act injuriously, either organically or functionally on the liver or alimentary canal, producing enteric effects of a serious nature, or congestions of various kinds. These congestions are commonly spoken of as colds, or a person is said to have taken a bad cold. I am not aware that any cold, so called, is a good one, but I am convinced that cold is not the cause of any such ailment. When the system is developing such an ailment, exposure to cold may determine the particular kind of congestion produced, or the organ chiefly affected, being thus an incidental influence, but not, in any proper sense, the cause of the disease. The cause seems to be a deteriorated state of the blood, arising in most cases from defective alimentation, from the use of food of difficult digestion or unhealthy nature. The result will naturally be a supply to the blood of unhealthy nutriment, followed by injurious results to the heart, lungs, liver and kidneys, and congestions of the weaker parts of the system. Another series of complaints arises from the depositing in the tissues of calculous or other mineral substances, generally urates of various kinds. In hot weather animal food sometimes develops forms of alkaloids which are highly poisonous, known as ptomaines. From this cause canned meats are sometimes found to be poisonous without apparent cause. Now the same process may take place in the intestines, giving rise to diarrhœa, dysentery, and other dangerous affections. For all these classes of complaints nature has furnished a preventative and a cure in fruit. Ripe fruit is in such cases a corrective and also an opportune article of food.

Sweet fruits, such as bananas, are important additions to our list of foods, but are less important in a sanitary view than fruits containing acids. We may notice incidentally the general value of oranges for indigestion, and lemons and tamarinds in fevers, but these cannot be so important to us as native fruits, as they can never fill the place of these, and cannot be so generally used. To be generally useful to the whole people of this Province, or of the Dominion, fruits must be easily accessible in all localities, and sufficiently cheap to be obtainable by all. Peaches are a most valuable fruit, but from their limited area of production and perishable nature, they can only be a luxury to most of our people. Practically apples and grapes must be our great dependence for most of the year, with cherries and berries to fill the season, when the others are not obtainable. For a large part of Ontario apples, grapes, plums, cherries and berries will practically fill the year.

Ripe fruit is highly valuable as an article of diet. While a large part of its bulk is water, it contains most valuable elements of nutrition. The required albuminous and nitrogenous compounds essential to the fullest alimentation and health of the human

body are there provided. As nature shows by the growth of infants that the mother's milk is the most complete combination of food elements, it is interesting to notice that grape juice is almost identical in its nutritive elements, though with an addition of acids and their chemical combinations. It has therefore been suggested to substitute bread or other farinaceous substances and grape juice for bread and milk as a part of infants' and young children's food. I have no doubt that this is a valuable suggestion, especially in warm weather.

As most of these fruits contain a considerable amount of acids, malic, tartaric, citric, etc., this may appear an objection on the score of health. But these acids are combined with alkaline bases, which fact materially changes their action. One of the most common of these is potassium, which in these combinations is very efficient in eliminating noxious matter from the system. Thus tomatoes are of much value in liver, kidney and gastric complaints. Apples, besides malate of potassium, lime and other salts, contain phosphorous in sufficient quantity to act as a restorative to the brain and nerves; even sour apples will reduce a tendency to acidity in the stomach. Baked apples form one of the most agreeable, digestible and healthy items of food we possess. The writer has used them ordinarily at both the morning and evening meal for ten or eleven months of the year for many years, and he is convinced that this practice has been an important factor in the good health enjoyed in old age, better than he had thirty or forty years ago. The usefulness of the apple, no doubt, gave rise to the old Scandinavian idea that apples constituted the food of the gods; although we suppose that these old time gods did not have Rhode Island Greenings, Kings or Spies; nor, as the Fruit Growers' Association and Linus Woolverton had not yet arrived, the Princess Louise. At the season when apples become scarce, strawberries come in and supply one of the most valuable, perhaps the most valuable of all fruits in a medicinal point of view. Other berries follow and keep up a supply until apples again come in. The use of fruit is important in fevers, indigestion, liver complaints, rheumatism and gout. The grape cure is largely resorted to in France and Germany, where patients consume grapes beginning with a pound or two daily, and increasing to six pounds and in some instances to twelve pounds a day. Such treatment is beneficial in two ways: both for dissolving calculous deposits, and for washing out the tissues. As a general summing up, fruit may be described as beautiful (to the sight), delicious (to the taste), odorous (to the sense of smell), and healthful (to the body). In an old number of the "Horticulturist," September, 1880, Mr. A. Hood, Barrie, relates some remarkable cures of chronic diarrhœa and piles from the use of fruit, especially strawberries; and also of the cure of weakness and pain in the eyes by means of cream tartar; and he suggests the use of grapes for complaints of the eyes, as they contain a considerable quantity of this chemical. A medical opinion or two may here be in place. One doctor has said that farmers have no need for doctors when fruit is freely used. Another says: "Nothing does more to rid us of patients than the daily use of fruit. It clears the organs of every impurity." Certainly we have no ill will to the gentlemen of the medical profession, but in the general struggle for existence it will be better to invest money in apples or grapes than in doctors' bills.

For breakfast it would be much better for the general health of the community, if animal food were abolished, and, along with grain foods, to use fresh fruit when obtainable, or baked apples. For a light meal or lunch, Graham bread and fruit will be found satisfactory. For school children's lunch many articles are used, some of them very queer. Some of their baskets are supplied with pie, consisting principally of a sodden mass of combined grease and flour, and sometimes with villainous pickles as a relish. I understand that in England a common practice is to put in the child's lunch basket bread and cheese, and an apple. This is surely more rational, as well as being free from the charge of cruelty to children. The athletes of Greece are said to have been fed on figs, nuts, cheese and bread; the Moorish porters on brown bread and grapes.

While fresh fruits should be freely used when obtainable, there are many prepared sorts which may be useful, when the fresh form cannot be had. Grape juice may be prepared by heating to the boiling point and bottling hot, either sweetened or not. It should

not be allowed to boil, if the fine flavour is to be retained, and it should be kept in a dark place. Condensed must, or juice evaporated to the consistency of a syrup, and catsup or sauce, which may be spiced in various ways, are found worthy of trial. The ordinary mode of canning fruit is familiar to all. For this purpose glass jars are much better than tin cans. The old-fashioned apple butter, the manufacture of which, I fear, is becoming a lost art, should have its use revived. A variation of this may be suggested, in the cooking of apples with grape or other fruit juice, instead of cider.

Although not immediately connected with the subject of this paper, it may be mentioned that fruit is a valuable food for stock. Apples have been tried successfully with horses, keeping them in a healthy and vigorous condition; also with cows and young cattle. It has been found that the quality of butter has been much improved by supplying the cows with apples as part of their daily food. This may be a matter of importance to farmers, when they shall be induced to raise apples in large quantities.

What lessons then are we to learn from the foregoing? Certainly this, that every farmer should engage largely in the raising of fruit; and that every one who cultivates a garden should make fruit growing a leading interest. I am aware that the situation about Kingston is unfavourable. The soil is hard and cold, and the climate is not like that west and south of Hamilton. The ground needs a kind and amount of preparation which will involve an amount of expense and work beyond the requirements of more favourable localities. Still I am convinced that the results to be reasonably hoped for will justify the expense. I have sometimes been told that a farmer can buy fruit more cheaply than he can raise it. I fear that there is a misapprehension here. A farmer may annually drive into a city and buy a large supply of apples, for example, for a number of years at less expense than he can plant and care for an orchard; but this covers only part of the question. He cannot go daily in summer to a market for a supply of the small fruits which are essential for the health of himself and his family. And the cost of the orchard, which at first yielded no return, will diminish, while its returns will be increasing. No constant supply of fruit for the whole year can be satisfactorily provided in any other way than by home production for the bulk of it. Without actual experience no one can understand either the quantity and variety of fruits which can be grown on a comparatively small area of land, or the satisfaction and enjoyment derived from tending them, and watching their progress. As an encouragement for amateurs, I may mention my experience at Niagara Falls on about half an acre of hard clay soil on the Niagara limestone. There were several bearing apple trees already on the ground, and the only apple tree I planted was a large crab (Montreal Beauty). I had part of the ground trenched two spades deep, and well manured at first, and annually cultivated and manured afterwards. I planted and succeeded fairly well with most of the following varieties: 15 dwarf pears, 4 plum, 4 peach (on plum stocks), 3 cherry, 1 apricot, 10 grape, 3 currant, 4 gooseberry, 7 raspberry, 1 blackberry, 2 strawberry. Besides these, from want of knowledge at the time, I attempted to grow European grapes in the open air, which entirely failed. By experience I learned that some sorts were not so suitable as others. For example, the red Antwerp raspberry produced delicious fruit, but the canes suffered in winter, and were so large and brittle that they could not be laid down for protection. The new Rochelle blackberry, which was vigorous and healthy for two or three years, afterwards appeared to be tender.

To stick trees or plants into a hard soil as if they were stakes, and then leave them to grow or die as may happen, will not be successful; but with the selection of suitable varieties, proper preparation of soil, cultivation and care, I believe that fruit growing will be both enjoyable and profitable in any part of Ontario. But the local conditions vary so much that extensive experimenting will be necessary in order to cultivate varieties adapted to these conditions. I would advise every one who can control any amount of land, large or small, if not already a member of the Fruit Growers' Association, to become one without delay; to study carefully its researches, and to become an experimenter himself, so as to be able to decide intelligently on varieties adapted to local circumstances, and to assist in extending the area and the quantity of fruit grown throughout our country.

SOME CAUSES OF FAILURE IN APPLE CULTURE.

By L. Woolverton, Secretary, Grimsby.

Property cared for, the apple orchard is, comparatively speaking, one of the most valuable portions of the farm, even if it is only large enough for home uses. Situated as some farmers are, at a long distance from a railway station, or a good market, the expenses of teaming the crop might make the odds against growing a commercial orchard, but otherwise, taking one year with another, I believe the apple crop can be made to pay twice as well, acre for acre, as a grain crop, all things considered.

I am aware that I am courting opposition on this point, and grant that facts, in many instances, are against me. Even in the Niagara district, in the very centre of fruit culture, in the very best of soil and location, apple orchards just in their prime, beautiful, thrifty trees of the best varieties, are being mercilessly cut down and sacrificed on each side of me. The owners declare that they are unprofitable. They say that the trees will not bear, that the apples of late are smaller than they used to be, that the worms destroy the most of them, and that the small proportion remaining for the owner to harvest bring no price in the markets. They have therefore resolved to cut down their orchards, and dig them out by the roots, in order to devote their ground to the growing of grain and root crops, which they claim will pay them better.

I grant them honesty in their statements; I myself have observed the unproductiveness of the orchards, which are no doubt duplicated in every part of Ontario, and I venture to say that one of all of the following causes will explain the unfortunate conditions of affairs.

1. The Location of the Orchard.

A common notion is that any place will answer for the apple trees, and therefore very often a stoney corner that cannot be worked, or a very heavy clay which one does not want to work up, is set out to an apple orchard. That such an orchard would never be a success goes without proving.

But a more common fault for the location is a wet soil left without underdraining. Trees in such situations may grow well in summer, but are almost sure to become winter killed, or at least so injured by the cold in winter that they become enfeebled and unproductive. The remedy is plain. A thorough system of underdraining is of the first importance.

Another evil of the situation is exposure to high winds. Those who have had almost their whole crop strewed upon the ground in the autumn by wind storms know how to appreciate the favoring protection of a dense woods of deciduous and evergreen trees. This cannot be quickly remedied, but a windbreak of a double row of Norway spruce trees will, in twenty years, be of inestimate value in this respect.

2. Lack of Cultivation.

The second cause of failure, one of the most common, is lack of cultivation. Some how or other the idea has got abroad that the apple orchard needs no cultivation. True, there is no growth of wood, the fruit is small, and imperfect of its kind, but it never seems to occur to the owner that the trees would grow any better for being cultivated; or if he does believe in it, he does not sufficiently value his apple crop to give it the same attention as he would his corn or potatoes. There is need of a general waking up in question. I must confess to having been once of this opinion myself, but I have been converted. I have found that where the orchard is in an unthrify condition, so that the leaves are of a light green or yellowish tint and ripen early, and the fruit is scant and poor, cultivation is the surest and speediest cure, and will accomplish what pruning and manure will utterly fail in doing without it. Cultivation of the soil so exposes it to the action of the air as to make available the plant food which is already there in store, and besides, has a most important influence in counteracting the serious drouths to which our country is of late so subject.

One of my orchards which had been planted some twenty-five years was in the condition above described. It had been left seeded down for about ten years, and had become unthrifty and unfruitful. In the summer of 1886 I broke up thoroughly one-half of it, applied wood ashes and pruned it carefully, while the other half was pruned and manured, but not cultivated. The same treatment was continued during 1887, and the result was plain enough to the most casual observer. The cultivated portion resisted the drouth of that year completely. Its dark green foliage was a remarkable contrast to the light sickly green of the other part, and, more important still, the cultivated trees are laden to the very ground with such a load of fine Baldwins, Greenings and Golden Russets, as cannot be equalled by any other orchard on my fruit farm.

3. Lack of Manure.

Who ever thinks of giving his apple orchard an annual dressing of manure? All the manure is put on the field crops; no farmer would think of growing fine potatoes or a paying crop of grain without a heavy coat of manure, but the apple orchard must shift for itself, without either cultivation or manure, and then if it does not yield a paying crop it is condemned as worthless, and ought to be cut down because it does not pay. Is it the fault of the orchard or of the orchardist? Why should it be expected to do what no other farm crop could possibly? Why, the farm was perhaps cropped for years before the orchard was planted, and the fertility of the soil well nigh exhausted; trees have been drawing on the soil for years, and now are blamed for unproductiveness. Is this reasonsonable, I ask?

But says one, "I cannot spare the manure from my other crops." Very well. You must put it where it will pay best, but I claim that place is the orchard.

I find that farmers generally in Canada quite under estimate one of the most valuable of orchard fertilizers, and either let it waste or sell it for a mere song. I refer to our wood ashes, which are so undervalued in Canada that Canada ashes have become an article of export to enrich the fruit farms of our Yankee neighbors who purchase them by the car load.

The following is an advertisement clipped from an American paper:—"Canada Hardwood Unleached Ashes, by rail in carload lots furnished on short notice. Ashes guaranteed to be of best quality, and are especially adapted for all grass and fruits. Pamphlets and prices sent on application, Munroe, Judson & Stroup, Oswego, N.Y." This is only one of many. Such quantities have been imported from Canada into the United States that a special bulletin has been published by the Connecticut State Experimental Station, showing the analysis of the various brands. The market value is twenty-five cents a bushel, although their real value is much higher.

The following table shows the value of wood ashes compared with stable manure and with a commercial fertilizer which we may call a complete manure:

Comparative Value of Wood Ashes.

In 1,000 pounds of wood ashes there are, say,

60 lbs. of potash at 7 cents per lb	$4 20
20 lbs. of phosphoric acid at 5 cents	1 00
700 lbs. of carbonate of lime	5 20

About one-half cent per pound. The remainder consists of magnesia, insoluable matter and moisture.

One bushel weighs about sixty pounds and is, therefore, worth from 30c. to 60c.

In 1,000 pounds of complete manure there are:

70 lbs. nitrogen at 20 cents	$14 00
30 " potash at 7 cents	2 10
60 " phosphoric acid at 5 cents	3 00
	$19 10

Or nearly two cents a pound.

In 1,000 pounds of stable manure there are :

5 lbs. nitrogen at 20 cents	$1 00
6 " potash at 7 cents	42
2½ " phosphoric acid at 5 cents	12
	$1 54

Or one seventh cent a pound.

Leached and unleached Canada ashes have approximately the following percentage composition :

	Unleached ashes.	Leached ashes.
Sand, earth and charcoal	13.0	13.0
Moisture	12.0	30.0
Carbonate with some hydrate of lime	61.0	51.0
Potash (chiefly as carbonate)	5.5	1.1
Phosphoric acid	1.9	1.4
Other matters by difference	6.6	3.5
	100.0	100.0

It appears from this statement that more than half the weight of both leached and unleached ashes consists of lime, partly as hydrate but chiefly as carbonate ; the same material chemically as chalk or limestone, but finer and so likely to be quicker in its action.

Now, potash is a most important fertilizer for the orchard, (1) it promotes growth, (2) it improves the flavor of the fruit by causing an increase of sugar and a decreasing of acid, (3) it improves the color of the fruit, and this is very important in apples intended for the market. Apples draw heavily on the soil, and especially upon this element. It has been stated on very good authority that 100 barrels of apples draw more heavily on the soil than a crop of fifty bushels of wheat.

By reference to a table showing the constituents of the apple, the reason will be obvious.

Analysis of the Apple Constituents.

1-1000 parts of apple contains :

Water	831.	Lime	.1
Nitrogen	.06	Magnesia	.2
Ash	2.2	Phosphoric acid	.3
Potash	.8	Sulphuric acid	.1
Soda	.6	Silicic acid	.1

From all this it is evident that two of the most important elements, as potash and phosphoric acid, are supplied in wood ashes.

With regard to the action of ashes upon the soil, it is important to notice that a heavy application of unleached wood ashes to a heavy soil is damaging to its texture, rendering it heavier still, more tenacious, and inclined to be cloddy. But for this reason its action on light soils is highly beneficial, rendering it more compact, filling up the pores and keeping it moist. It also tends to correct "sourness" in the soil by precipitating the soluble iron salts which are sometimes over abundant.

Another benefit is that it promotes nitrification, or the process by which nitrogenous matters in the soil are rendered available for the tree growth. It is thus evident that ashes have more value than simply for the amount of potash and phosphoric acid they contain, on account of their mechanical action, especially for light soils.

I have a hundred acres in orchard, and was almost in despair about fertilizing it properly, until I found I could buy ashes from farmers all about me for a mere song, and as much as I wanted. And now every winter I keep my team engaged collecting ashes for miles around and apply it to my orchard. The results are evident—apples in abundance and of such a size as astonished those who saw them ; Baldwins are often as large as Kings.

My soil is chiefly a sandy loam, and consequently of just the character to be most benefited by wood ashes.

The quantity applied is about one-half to one ton per acre, or about one-half a bushel to a bushel per tree.

5. The Ravages of Insects.

The ravages of insects is no less important a factor in producing failure in apple growing for profit than the others I have mentioned. The man who neglects to spray his apple orchard in June with Paris green must expect his crop to be thinned out one-half by the Codling moth in September.

Some people even yet need to be convinced of the importance of this, but those who have given it careful trial agree in its benefits. I have tried spraying for the Codling moth for ten successive years, and where carefully done, and repeated if washed by rains, I have found a great saving of my apples and a general improvement in their quality.

Few of us growers are exact enough with our experiments to say precisely what proportion of the crop is saved by spraying. A careful experiment was made on one occasion at the Geneva Experiment Station, N.Y. The trees were mostly Fall Pippins, and every alternate tree was treated twice in the month of June, first about the 3rd, and then again about the middle. The total number of apples was carefully counted, also the total number of sound and of wormy apples, and the percentage of wormy apples was carefully estimated for both sets of trees. The result showed 13 per cent. of wormy apples on the sprayed trees and 35 per cent. of those not sprayed. This would amount to twenty-two barrels out of a hundred saved by spraying, and estimating the value at $1 per barrel, the gain would be somewhere about $22 per acre of orchard.

Judging from my own experience I do not believe that this estimate is too high.

While packing my apples and pears last season I was more than ever convinced of the great benefit of spraying with Paris green. In some portions inaccessible to the waggon, this treatment was neglected, and as a result, an immense crop of codling moths was harvested, and innumerable apples wasted; while those trees carefully treated were almost free from this mischief-maker. And that is not the only benefit; indeed, quite as important is the perfection of form of the sprayed fruit. A Duchess apple tree always bore knotty fruit previously, but since being treated to Paris green its fruit has been perfect.

The codling moth also attacks the pear, and therefore the pear orchard should also be sprayed in the same way as the apple for its destruction. The Bartlett pear is especially subject to produce knotty specimens, due to the work of the curculio, and other insects. Indeed, fully half the crop has to be thrown out for seconds on this account. But for two seasons now, I have sprayed them carefully, and as a result, have had comparatively few knotty pears. The editor of *The Country Gentleman*, in a recent number, gives his experience in spraying Bartlett pears, and it corresponds with my own as given above. I copy from the journal outlines of two specimens, showing the effect of the treatment as described above, but with us the disfigurement has averaged greater than is here represented.

But the advantages of spraying for insect pests having been once proved it did not take long to find that it was of almost universal application. Our experiment stations soon discovered the benefit of copper sulphate for destroying fungi and of kerosene emulsion for such insects as did not eat the foliage but only sucked their nourishment from the leaves. These discoveries are creating a revolution in fruit growing and making possible the highest success for those fruit growers who will use to the best advantage the prescribed remedies. I will read a few lines by Prof. Bailey, of Cornell, on spraying trees, on this point; he says, spraying is of some value every year on apples, pears, plums and quinces. Nearly all the sprayed orchards are carrying a better foliage than those which are untreated, and where the codling moth, bud-moth, case-bearer and other insects are plenty, it has been of decided benefit. So, wholly aside from the idea of insuring against risk, it is advisible to spray for those insects which are

more or less abundant every year. Some insects and diseases appear late in the season, so that the spray may be needed at some epoch in the season.

Spray thoroughly, or not at all. I should say that fully half the spraying which I have seen in western New York in the last two or three years is a waste of time and material. Squirting a few quarts of water at a tree as you hurry past it, is not spraying. A tree is thoroughly and honestly sprayed when it is wet all over, on all the branches and on both sides of all the leaves. An insect or a fungus is not killed until the poison is placed were the pest is. Bugs do not search for the poison, in order that they may accomodate the orchardist by committing suicide. The one spot which is not sprayed may be the

Sprayed Bartlett, $\frac{2}{3}$ of natural diameter.

Unsprayed Bartlett, $\frac{2}{3}$ of natural diameter.

very place where a bud-moth is getting his dinner. On the other hand, there are many fruit growers who spray with the greatest thoroughness and accuracy, and they are the ones who, in the long run, will get the fruit.

Prof. Panton, of the O. A. C., Guelph, has issued a most convenient spraying calendar which every fruit grower should have, and which may be had on application to the Department of Agriculture, Toronto. He has also published a small book on "Insect Foes and How to Destroy them."

The *Flatheaded Apple tree Borer* is a most formidable enemy to the apple orchard. The months of June and July are the season when the parent beetle is most active in her search for a favorable place under the scaly bark, or in the crevices of the trunks of the apple trees. When an orchard is growing vigorously the young larva seems to be outwitted by the rapid growth of the wood, but when an orchard is grass bound and growing very slowly, the trees are almost sure to suffer, and oftentimes, if neglected, will be wholly destroyed.

Flat Headed Apple Tree Borer, *Chrysobothris femorata* Fabr: *a*, larva; *b*, beetle.

The beetle is about half an inch long, of a shinning greenish black above, and like burnished copper underneath, and will be readily recognized from the engraving. It is said to sometimes attack the pear and plum trees, but we have never been troubled with it except in our apple trees, where it was trouble enough until we knew how to fight against it. The presence of the larva may be detected by the rough, dark, and sometimes cracked state of the bark, usually on the north or northwest side of the trunk, or by the fine chips which

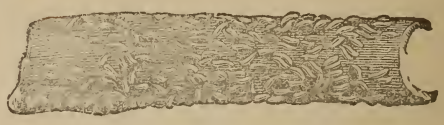
they exude from their holes when quite young. A sharp pointed knife will soon discover the hateful intruder, which will be at once seen to be truthfully represented in fig. —*b*, with its great flat head, which is altogether out of proportion to its body. Washing the trunks of the trees at this season with some alkaline solution is the easiest way of saving our orchards from this borer, as for instance with soft soap reduced with a solution of washing soda and water, the latter in the proportion of a quarter of a pound to a gallon.

Another formula is—Take one quart of soft soap boiled in two gallons of water, and while hot stir in one pint of Carbolic acid.

The *Oyster Shell Barklouse* is insignificant in size, but terrible by reason of its numbers.

Very few have any idea how common a pest this is in our Canadian orchards. Many people are wondering why their orchards are so unfruitful, and why they are so stunted in growth, and look so sickly, when the whole trouble is due to this pernicious little louse, which, unnoticed by them, is preying upon the bark of their apple trees in immense numbers, sucking out their strength and life.

Last summer toward the end of May a neighbor brought in to the writer a branch of a young tree from his orchard asking, "What is the matter with this tree?" The tree would not grow, and he had discovered that the bark was curiously rough with numerous tiny scales about one-sixth of an inch in length, as shewn in fig. 1. Upon lifting one of these scales and using a hand glass the question was soon solved. To his astonishment, there were revealed nearly one hundred wee little lice, too small to be readily seen by the naked eye, and which ran about with the greatest speed over the bark as if delighted at their liberation from the confinement of the maternal shell. No wonder the tree was stunted!



Oyster Shell Bark Louse.

This louse belongs to the genus *Coccidae*, and is allied to the aphis, bed bug, and body-louse. It was introduced into this country some eighty years ago from Europe, and although the female cannot fly, and hence migrates slowly, it has now become more or less distributed throughout our whole country.

The time to destroy these bark lice is early in the month of June, because at that time the young brood escape from under the scales where they hybernate, and which are actually the dead bodies of the mother lice. The loose bark should first be scraped off with a hoe, because the cunning youngsters hide away carefully beneath it, as if they were trying to escape discovery.

Then the trunks and large limbs must be washed with a strong solution of soft soap and washing soda, with enough water to enable one to apply it with a paint brush, or scrubbing brush. If the lice have spread over the limbs, the whole tree must be sprayed with a solution of washing soda and water in the proportion of half a pound to a pailful, or potash and water, two pounds to seven quarts. Caustic soda and water is recommended as still more effective.

There are several insects which prey upon the bark louse, as also some insectivorous birds, but unfortunately this hateful insect increases out of all proportion to the number of its destroyers, and unless vigorous remedial measures are employed, some of our best orchards will die of premature old age.

6. Bad Harvesting.

Even presuming that the orchard has been properly cultivated, pruned and enriched, there are many who yet fail to handle the fruit to the best advantage. In the first place, it is a common mistake to leave the fruit hanging too long on the trees before picking, and in consequence they become too ripe to keep well, and a large pro-

portion is spoiled by falling to the ground. My experience has led me to begin gathering much earlier than formerly, and indeed before my neighbors seem to think of it. At one time it was my rule to begin gathering them about the 9th of October, but the high winds of that month made such havoc with them that I soon changed that rule. The 20th of September is none too soon to begin with such kinds as have attained full size and color, and if by that time all the apples upon a tree have not reached maturity, it will pay to make two pickings, leaving the greener and smaller ones to grow and color up. Attention to the details of preparing fruit for market always returns a good profit and must not be grudged. Careful handling and careful sorting are of paramount importance. Many throw apples into the basket as if they were potatoes, or squeeze them with thumb and finger as if they were made of stone, and so leave marks which spoil their beauty. Round swing-handle baskets, attached with a wire hook to the rounds of the ladders, are the best for apple packing.

Most orchardists empty their apples in piles upon the ground, but sorting in that case is back-breaking work, and every rain delays it. Some empty them in heaps upon the barn floor, but in a large orchard this means much labor in carting. My custom has been to empty into barrels in the orchard, the heads of which are left in the bottom, and store under cover; and then in packing empty them out on a packing table for sorting. For young orchards and scattered varieties this is the best plan I know of, for the important work of packing can then be done in a clean, dry place without moving about with nails and mallets and press from one part of the orchard to another.

Many inquiries are received concerning the best plan for a farmer to dispose of his marketable apples—whether he should sell them at home or ship to a foreign market. Well, if he has a very large orchard, so that he can ship by the carload, or if he has small lots of one special kind, such as the Gravenstein or King, I would say ship to some reliable English wholesale house. As I can show from my account sales, my Gravensteins and Kings, in some ordinary seasons, have sold in Covent Garden Market, London, England, as high as $6 per barrel, which I consider paid me very well. Of course these apples were extra selected, all No. 1 grade, and highly colored.

But with mixed lots, less than carloads, it is better to take $1, or even 75 cents per barrel for the fruit at home, than risk a possible loss by shipping so far.

But at even $1 a barrel, I ask what farm crop pays better. Take for example an acre planted entirely with Baldwins and Greenings, and what will it pay you at those prices? Suppose you only get 100 barrels a year on an average from it, what other crop would give you $75 or $100 per acre with less labor.

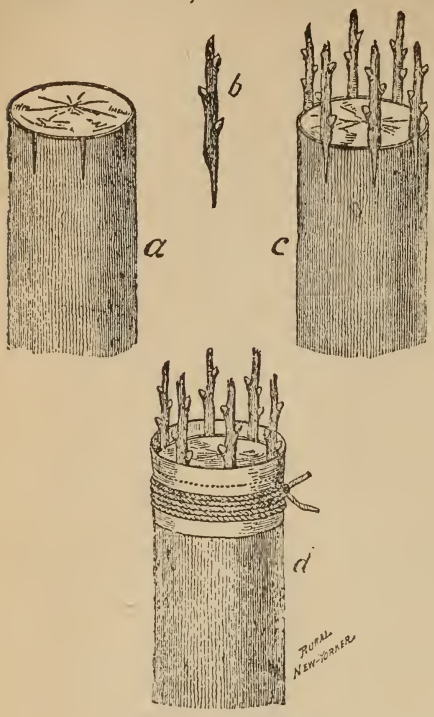
Of course it is expensive work planting and raising an apple orchard, a heavy investment; but I am not urging the planting of new orchards so much as the better care of those we have.

7. Poor Varieties.

Perhaps you have not the most profitable kinds; then top graft and you will soon have those varieties which are proved most desirable. The work is not difficult or mysterious, but quite practicable by anyone who can handle his knife skilfully; but for old trees a method known as crown grafting is very well adapted, as figured in a recent number of *The Rural New Yorker*, and by favor of the editor we are enabled to give our readers the following description of it with an excellent illustration:

"The following is an easy and effective method of grafting old trees. By it the percentage of failure is reduced to a minimum, and branches at least six inches in diameter, and, in the case of pear trees seventy-five years old, may be worked with assured success. Last year we mentioned the case of such a pear having been grafted two years before with the Kieffer, that gave a full crop last fall. Saw off the branch at right angles to the stem to be grafted as at Fig. ——*a*. Then cut a clean slit in the bark through to the

wood, as shown—a slit the same as in budding. Separate the bark from the wood and insert the cion *b*, one for each slit. The number of slits for each stock will be determined by its size. We will suppose the stock illustrated to be six inches in diameter, and that six cions are to be inserted. The stock after receiving the six cions is shown at *c*. Grafting wax is not needed. A thick paper may be wound about the top of the stock extending about one inch above it and securely tied with a strong twine, as shown at *d*. The space above the stock encircled by the inch of paper may then be filled to the top of the paper with a puddle of soil and water, made so thin that it can be readily poured from any suitable vessel. This mud protects the surface of the wood of the stock, and excludes the air from the insertions. It gives every advantage of wax without its objections. Of course, stocks of any size may be worked in this way. One, two, or any number of cions may be inserted according to the size of the stock.



Cut of Crown Grafting.

I have now given an outline of the chief causes of failure in apple growing in Ontario, and at the same time indicated how they may be overcome. I believe in the future of apple growing in Ontario, for we can grow the finest apples in the world, and our fruit is wanted. Let us grow it in that perfection to which our soil and climate so well adapts our Province, and then establish a reputation for first-class honest packages of selected high-grade fruit, and our fruit growers will be the most successful class of people in Canada.

PEAR GROWING.

By R. L. Huggard, Whitby.

The pear was a very common fruit many centuries ago. In the earliest records of the Roman nation pears were an article of commerce, and were quite common in Syria, Italy and Greece. Theophrastus speaks of the productiveness of the old pear trees, and Pliny describes the varieties as exceedingly numerous, and names many varieties, but the same authority aptly remarks, that all pears whatsoever, are but a heavy meat unless they are well boiled or baked, therefore we may fairly conclude those ancients did not have any of the Bartlets or Seckels of the present day.

In planting a pear orchard there are a few very important things to be considered: (1) The location should be (in this country) on a southern or western slope, if possible, and not on a northern or north-eastern exposure, for most varieties. (2) The soil. The best soil to grow pears on is a pretty heavy clay loam, or a loamy top with a good clay sub soil, and as the average pear is a strong, rampant grower, a strong clay sub soil is of great importance, but the land should be thoroughly underdrained for a pear orchard as well as for any other orchard. (3) In planting, I prefer two year old trees in free growers, and three year old from the bud, for the slower growing varieties, such as Lawrence, Beurre d' Anjou, Tres Druard and others. The land should be well worked one year at least before planting, and the holes for the trees considerably larger than what is neces-

sary to receive the roots. When planting, I always prune the roots, first cutting back to the sound wood, then set the tree in place, throw in a few shovels of loose top soil, shake the tree up and down a few times, then add a few more shovels of earth till the roots are covered, then tramp all very solid. This is just where many planters make a serious mistake in not packing the earth firmly enough when planting. If planting in spring, the pruning should be done as soon as planted and every branch should be cut away except two or three at most, and these should be cut back to a few buds of the last year's growth. Some people seem to think that when they get their trees into the ground that their work is done and in a year or two every tree should be loaded with lucious fruit, and if not, that unscrupulous agent has cheated them. They never take into account the number of hours, or even days, the trees were lying in the driving barn or wood-shed before planting; or if planted immediately, the work was left to the hired man or the boys, who perhaps never helped to plant a tree of any kind. I have known many instances where a few trees were purchased for garden planting, and the ladies had to do the planting themselves or it would not have been done till all the trees would have been dried up. In a young orchard the land should be regularly kept cultivated; I usually plant a crop of corn the first year, this serves a double purpose. First, it gives the cultivation necessary to get a good crop of corn, requires thorough stirring of the ground, and second, the corn protects or shades the young trees from the sun during the hot summer. We, in Ontario, usually have held, I believe, that the ground in all young orchards should be kept cultivated for at least the first seven or eight years. Hoe crops can be grown without injury to the trees for several years after planting, provided that the land receives a good coating of manure each alternate year. The young pear trees should be kept well pruned till they get into full bearing, after which they require very little pruning of any kind.

I do not propose to speak very dogmatical on varieties, but there are certainly some kinds more hardy than others, some of which I would not be afraid to plant in suitable soil in the county of Frontenac, such as Bartlett, Beurre d'Anjou, Lawrence, Keiffer and Seckel, and make money out of them; but there are others I have tested that I would plant sparingly, viz.: Clapp's Favorite, Howell, Flemish Beauty, and some others that grow very rapidly, but do not always ripen their wood, the scions thereby becoming blighted from frozen sap. But here, Mr. President, I must close, as I suppose the rule here applies, as at the Missouri Convention, that was passed there, viz.: "Be it resolved that at this convention no discussion will be permitted on religion, politics or pear blight." Many people imagine that the pear is a short-lived tree, and conclude it's not worth the trouble to set them out, but I will give you a few facts which I think will convince the most sceptical. The pear in its wild state is more hardy and longer lived than the apple. Mr. Box mentions several that are known to be over 400 years old One pear tree in Herefordshire, England, Loudon says, in 1805 covered more than half an acre of land, and from the fruit of it, on more than one occasion, there were fifteen hogsheads of perry made, in a single year. Another remarkable pear tree grown in Illinois, which at forty years old measured round the trunk six and one-half feet nine feet from the ground; it yielded in 1834, 184 bushels pears, and in 1840, 140 bushels.

Also along the Detroit River, on both the Canadian and the American sides, are found many very old large trees still growing and bearing fruit of quite as good quality as some of more modern origin.

You have only to ask the schoolboy of to-day, or the schoolgirl either, what is the best fruit of to-day, and they will tell you at once the pear.

"For it keeps well, it eats well, it is juicy all the year;
No other fruit compares with it, the rich, the luscious pear."

CURRANTS, AND HOW TO GROW THEM.

By R. B. Whyte, Ottawa.

Of all fruits that can be grown in this country the currant gives the greatest return for the labor expended. No matter how poor the soil or how careless the cultivation you can expect a crop of currants, though the difference between a box of currants such as is generally offered for sale, and a box of, say "Moore's Ruby," such as I have grown, every bunch with twenty to twenty-four berries on it, is very great, and the difference in quality is even greater. There is no fruit that responds so readily to good feeding and careful cultivation.

The best soil is a good sandy loam, which should be deeply spaded and well manured before planting, as the roots grow very close to the surface and should be interfered with as little as possible after planting.

All varieties grow freely from cuttings of the present year's growth, which do best planted in August, though very well any time before frost or in the following spring.

Make cuttings about six inches long, plant in rows a foot apart, inclining the cuttings at an angle of forty-five degrees, so that the lower end won't be too far below the surface, leaving one inch above ground; mulch with light manure or sawdust to keep the earth moist, and by the end of the following summer ninety per cent. of them will be good strong plants ready to be set out in their permanent quarters. Give them plenty of room—about six feet each way is little enough; after planting, mulch with well-rotted manure. Of course a year can be saved by buying your plants from a nurseryman, and they are sold so low now, that when only a few are wanted for home use it is the better way.

All the cultivation that is necessary the first year is to keep down weeds and pinch out the tip of any shoot that is growing too fast for the rest.

The second year there will be a few bunches of fruit, the third year enough to pay expenses, and a full crop every year after for ten or twelve years, when it is better to start a new plantation, as the finest fruit is got from bushes three to six or seven years old. Pruning after the second year consists in cutting out all surplus canes from the centre of the bush, and all that tend to lie on or close to the ground. The best season for pruning is in August after the fruit is off and wood growth has ceased.

If you want to grow the largest berries possible, in June when the new wood is about six inches long pinch out the ends of every shoot. By so doing you check wood growth and throw the energies of the plant into the fruit, and also very much reduce the amount of pruning necessary in August. Good feeding requires a mulch of three or four inches of stable manure every fall, two to three feet on each side of the row, which should be supplemented by a dressing of bone dust and a good potash fertilizer, at the rate of one and one-half pounds of the mixture to each bush in the spring. The winter mulch may be forked in *very lightly* in the spring, or may, if not objected to on the ground of untidiness, be left on all summer. The less the earth is disturbed within three feet of the stem the better, as the roots being near the surface a great deal of mischief is done by deep cultivation, even with a digging fork. A spade should never be used near currants. If the soil is very light a mulch of straw or marsh hay is very useful in conserving moisture in a dry season; but if water is available and the rake is industriously used to keep the surface friable, a mulch is not necessary.

The great enemy of the red and white currant is the "currant worm," which works such havoc in May, if not checked, destroying in a few days every leaf on the bush, and with the leaves goes the crop for that season. The first brood is hatched out in this locality about the 20th to 24th of May, As soon as they begin eating the leaves apply Paris green, one teaspoonful to a wooden pail of water, with a whisk, or better, a spray pump, being careful to get it well into the centre of the bush when the worms begin their work. One application, as a rule is enough for the season, but some years a second brood

appears as the fruit ripens. It is not safe to use Paris green then, but a good substitute is white hellebore, about one ounce to a wood pail of water, applied in the same way as the Paris green.

The only other enemy of the currant worth considering is the currant stem borer. The parent insect lays her eggs near the buds; when hatched the larva eats into the centre of the stem, travelling up and down living upon the pith. Their presence may be detected by the sickly look of the leaves and small size of the fruit. The only remedy is to cut out the afflicted canes and burn them.

In black currants, Leés Prolific is a good variety, much superior in size and flavor to Black Naples or Black English. Champion and Prince of Wales are said to be good kinds, but I have not fruited them yet. The Crandell so industriously puffed by some nurserymen is nothing but the old Ribes Aureum or Golden Currant of old gardens, a very pretty flowering shrub but as a fruit it is utterly worthless. The crop is so small as not to be worth picking and the quality so poor that I have never met anyone that would eat a second one.

In whites, by far the most extensively grown is "White Grape," long considered the finest flavored of all currants. Unfortunately it is rather small in size and has a bad habit of dropping the end berries of the bunch. Last summer I fruited for the first time "White Gondoin" and was very much pleased with it. Though rather more acid than White Grape it is so much larger in bunch and berry that it will prove a formidable rival to that old favorite.

Among the reds "Moore's Ruby" is decidedly the best variety I know of—an upright, strong grower; bunch long—frequently twenty-two long berries in the raceme; berry large; a prolific bearer, and quality the very best, sweeter and finer flavored even than White Grape. I have grown it for ten years and have yet to find a fault in it.

An excellent variety is "Wilder Red," not so sweet as Moore's Ruby but very desirable, as large in bunch and berry as "Fay" and a much stronger grower. The weak growth of the "Fay" is its greatest defect; one of the largest berries, good bunch, good quality and a heavy bearer, but it is such a straggly grower and so prone to split in the forks when loaded with fruit that it will always be a short-lived bush.

A new variety much advertised, "North Star," does not justify the claims made for it. Though a strong grower and apparently going to be a heavy cropper, neither in size or quality is it the equal of any of those mentioned above.

"Raby Castle" and "Victoria" are two old sorts that if not the same are so nearly alike that there is no use growing both of them, heavy bearers, but only medium in size and quality.

The "Cherry," though a large showy berry, is too shy a bearer to be a good market variety, and too acid to be suitable for home use.

"London Red," though a very heavy bearer, one of the heaviest with me, is too small and too acid to be desirable.

"Red Dutch," though better in quality, is too small to be profitable.

SOME GOOD HERBACEOUS PERENNIALS.

By R. B. Whyte, Ottawa.

Herbaceous perennials are those plants whose roots remain in the ground from year to year, the foliage dying down to the surface of the ground every autumn to grow up with renewed vigor in the spring. As most plants of this class do best if their roots are not disturbed for several years, it is necessary in preparing a perennnial border to dig deeply and fertilize well before planting. Though many of them are perfectly hardy without protection all are the better of a coating of four or five inches of strawy manure in the fall. Leave it on as late as possible in the spring so that the rain may wash out

the soluble plant food. As soon as growth begins rake off and remove the surplus straw and rake or very lightly fork over the surface, being careful not to disturb the roots. Never use a spade in the perennial border.

A very frequent objection to the free planting of herbaceous perennials in the garden border is that it costs too much to buy the plants. There may be some truth in this if one wants to get all the novelties as they are sent out at high prices ; but there are many of them that cost little more than geraniums or other bedding plants that have to be renewed each season, and with this great advantage in favor of perennials, that they increase in vigor and beauty every year, and after the third season most of them can be divided and multiplied as much as desired ; while if one is willing to wait a year many of them can be grown from seed at a very small expense.

All of the following are well tested sorts, quite hardy even in this cold section of Ontario, and vary in flowering season from the first week in May till the snow falls :

Iceland Poppy, *Papaver Nudicaule.*—This dainty little poppy, one of our most valued perennials, opened its first flowers on May 4th last season, and was more or less in bloom till the last of October. The flowers, in white, yellow and orange-red, of which yellow is the commonest, are somewhat cup-shaped, one and one-half to two and one-half inches across, on long, wiry stems about twelve inches above the leaves, are well adapted for cutting—if cut in the morning early after opening, they last for several days. It is easily grown from seed, and will bloom the first year if sown in April or early in May. It, like all poppies, does not take kindly to transplanting and should be sown where it is to remain. They are easily wintered, even as far north as Ottawa, if covered in the fall with straw or cedar brush.

Oriental Poppy, *Papaver Orientale.*—A great contrast to the dainty little Iceland is the gorgeous Oriental Poppy, one of our most striking and showy garden flowers. The great flowers, six to eight inches across, dark scarlet in color, are held well up above the leaves on long, leafy stalks. Unfortunately the flowering season is short—only two or three weeks in June—and their glory is gone, though some years they show an odd bloom during the summer. They also can easily be grown from seed and are quite hardy.

Tall Leopard's Bane, *Doronicum.*—A very desirable perennial, that is not as well known as it should be is the Tall Leopard's Bane, *Doronicum plantagineum excelsum*, a very early-blooming yellow composite, coming into flower early in May, and lasting two to three months The large flowers, about four inches across, are borne on sparsely leafy branching, stems three to four feet high, rising from a large cluster of heart-shaped leaves on long petioles, decidedly the best yellow composite. Another Leopard's Bane is *D. Caucasicum*, not so large in plant or flower, but otherwise much like it. Both are usually propagated by division in spring or fall.

Double Sunflower, *Helianthus Multiflorus fl.pl.*—A deservedly popular autumn flowering yellow perennial is the Double Sunflower, rather rough in leaf and stalk to make a good cutting flower, but very effective in the garden. The flowers are from three to four inches across, a good rich yellow, perfectly double, and last a long time after opening. In bloom from August till frost comes. It has not proved perfectly hardy here, and requires the protection of a good mulch of manure during the winter.

Chinese Bell Flower, *Platycodon Grandiflorum.*—This is the best blue perennial we have, and grows from two to three feet high, and is covered from middle of July till October with deep blue bell-shaped flowers, from two to three inches in diameter, perfectly hardy and easily grown from seed. If planted in May will flower abundantly the following year. There is a white form that is not so desirable, as a slight tinge of blue gives it a faded look.

The genus *Spiræa* furnishes some of our very best perennials. Among the shrubby species Van Houtti, Bumalda and many others are well worth growing where space will permit. The best of the herbaceous species are the following :—

Double-White Meadowsweet, *Spiræa Ulmaria fl.pl.*—From a dense cluster of root leaves rise leafy stalks about three feet high, covered on the top with a solid mass of creamy-white fluffy flowers, from about July 1st to August 15th. The foliage is quite

ornamental before and after flowering, if the flower stalks are cut out after blooming. It is propagated by division in spring or fall, and should be shifted every three or four years, as it increases so rapidly that it is apt to die in the centre of the clump if left too long in the one place.

Queen of the Prairie, *S. Venusta.*—A weaker growing species. Does not make such a bushy clump as *Ulmaria*, but grows about a foot higher. The clusters of flowers are more elongated and are a bright pink in color. Season about a week later—decidedly the showiest of the herbaceous *Spiræas.*

S. palmata elegans.—A very graceful plant, about three feet high, with flattish clusters of pink and white flowers, lighter and more delicate in growth than *Ulmaria.* Though somewhat of the same habit, it is upon the whole the most beautiful and desirable of the genus.

Phlox decussata.—The new varieties of the old fashioned perennial *Phlox* have raised it from the position of a very common place flower, limited in color and small in size, to that of one of our most valuable perennials. From no other can we get such a mass of color in the border or such a variety of shades. One English house catalogue, 145 varieties ranging from white through all shades of pink to dark red, and from the palest violet to dark purple. Their season of bloom is from July till fall, some varieties flowering earlier than others. The first clusters are the largest and finest, but if the tops are cut off some of the shoots as soon as the buds form, they branch out and produce fine heads of flowers late in the season.

A good half dozen varieties are:

The Pearl, white.

Sir Richard Wallace, large white with violet eye.

La Soleil, lilac-rose.

Isabay, orange salmon.

August Riviere, fiery-red shaded violet.

Frau Von Spiemen, salmon pink; a very fine sort, flowers one and one-half inches across, slightly curled inwards at the edge.

Gas Plant, *Dictamnus Fraxinella.*—A very showy and interesting plant that shoulds be more widely known. It increases so slowly, often growing for years without any apparent increase in size, so that it has not been very widely disseminated, very few gardens being so fortunate as to possess a good specimen. It grows about two feet high, a well established plant, being about as much in diameter, each stalk terminated by a spike of rosy flowers eight or ten inches long, at their best for a month after May 20th. The leaves resemble those of the Ash and if gently pressed emit a perfume like lemon peel, but if bruised the odour is balsamic and somewhat strong for most tastes. The volatile oil that produces this odour is secreted so freely that if a match is applied to a newly-opened flower on a hot day a slight explosion ensues.

D. F. alba is a very handsome variety with pure white flowers.

Moneywort or Creeping Jennie, *Lysimachia Mummularia.*—If you have any place too much shaded by house or trees for any of the ordinary flowering plants, or even grass, to grow, but which you would like to have covered, try *Lysimachia Mummularia*, Money Root or Creeping Jennie, by far the best creeping perennial we havf for that purpose. It spreads rapidly, rooting at the joints and throwing out lots o side branches, but as it does not produce underground shoots it is easily kept within bounds. The leaves are oval in shape, about twelve inches long, of a rich dark green color, and are produced so freely as to completely cover the ground. The flowers, bright yellow, cup shaped, about three-fourths of an inch across, are in great abundance during June and July.

APPENDIX I.

OUR AFFILIATED HORTICULTURAL SOCIETIES.

All members of affiliated societies receive free the *Canadian Horticulturist* (monthly), recently enlarged to include floriculture; the Annual Report of the Fruit Growers' Association of Ontario; some new flowering or fruiting plant from that Association; and a lecture at the society hall by some competent horticulturist, sent by the Ontario Association.

BELLEVILLE.

OFFICERS FOR 1897.—*President*, W. C. Reid; *1st Vice-President*, S. J. Wedden; *2nd Vice-President*, William Kemp; *Secretary-Treasurer*, W. Jeffers Diamond. *Directors.*—A. M. Ketcheson, John Aris, Dr. Tracy, John Harris, James Copeland, William Connors, J. W. London, F. Davey Diamond, W. Jeffers Diamond. *Auditors*—J. W. Butterfield, William Rodburn, James A. Conger.

BRAMPTON.

OFFICERS FOR 1897.—*President*, Dr. C. Y. Moore; *1st Vice-President*, Henry Dale; *2nd Vice-President*, John Jeffers; *Secretary-Treasurer*, Henry Roberts.

BURLINGTON.

OFFICERS FOR 1897.—*President*, Geo. E. Fisher; *Vice-President*, J. S. Freeman; *Secretary Teasurer*, A. W. Peart; *Assistant-Secretary*, Geo. N. Peer. *Directors.*—Apples, E. Peart; grapes, Chas. Dynes; pears, W. V. Hopkins; peaches, John Ireland; plums, W. F. W. Fisher; cherries, T. Foster; vegetables, J. W. Bridgeman; shipping, Joseph Lindley, J. S. Freeman, O. T. Springer. *Auditors.*—J. R. Blanchard and F. Parsons. *Executive Committee.*—Dr. Husband, Alex. Reach, S. W. T. Glover.

Reports on the various fruits for the year were made by Geo. S. Fisher, on apples; A. W. Peart, grapes; H. T. Foster, small fruits; W. V. Hopkins, pears; W. F. W. Fisher, plums, and J. S. Freeman, shipping.

The President, Geo. E. Fisher, in his annual address, referred to the usefulness of the Association in promoting mutual sympathies and co-operation among its members, and in affording opportunities for the interchange of knowledge and experience. The unusual apple twig and pear blight was one of the striking features of the past season. He believed that better times were ahead of us, and that we might expect higher prices in the future than those that prevailed during the past season. The time had come, he thought, when more attention should be paid to quality and marketing. He also spoke of the possibilities of cold storage as applied to our more perishable fruits, and considered that when it was an accomplished fact, large quantities of pears and grapes, as well as tomatoes, would be shipped to Great Britain.

We are able to report another successful year for our Society. Our numbers are gaining year by year, and a deep studious interest in all pertaining to fruit-growing pervades our Association. Three regular meetings, several special ones, and the annual have been held.

At each of these, valuable information has been given. The acreage is still increasing, more particularly in the direction of smaller fruits. We believe, however, that the conditions affecting our business demand for the future *intensive* rather than *extensive* fruit culture, that we should take better care of the trees we already have rather than plant out more, and thus improve the quality and quantity per acre.

In common with the rest of the Province we had a very heavy crop of apples. Most of our members packed their own apples and sent them to the Old Country. Early in the season the twig blight did some damage to such apples as the Holland Pippin, the Ribston, the Pewaukee, Gravenstein and Snow. Pear blight too, did a good deal of mischief. Fungous diseases cut little if any figure here last season. Apples were clean, and grapes were without mildew. Of insects the Codling moth did the most damage.

During the year papers or addresses were given by Messrs. O. T. Springer on "Apples"; W. F. W. Fisher, on "Currants"; the Secretary, on "Horticultural Education"; and Mr. Beadle, of Toronto, on "Insect and Fungus Pests."

DURHAM.

Officers for 1897.—*President*, Christopher Firth; *1st Vice-President*, G. McKechnie; *2nd Vice-President*, Robt McFarlane; *Secretary*, Wm. Gorsline; *Directors*, D. Jackson, Henry Parker, N. H. Campbell, Thos. Brown, Dr. James Gun, Jas. Birt, C. L. Grant, Geo. Bennie, John H. Kilmer, John Kelly.

GRIMSBY.

The annual meeting was held on the date fixed by law, and the following officers elected: *President*, Mrs. E. J. Palmer; *Vice-President*, L. Woolverton; *Second Vice-President*, Mrs. A. Pettit; *Secretary-Treasurer*, E. H. Reid; *Directors*, Mesdames D. V. Lucas, H. Smith, J. W. G. Nelles, and Messrs. A. Terryberry, W. Gibson, C. W. VanDuzer, John Grout, A. Pettit, E. H. Reid,

It was resolved to make a distribution of potted chrysanthemums in early summer, and have a chrysanthemum show in November.

At the spring meeting, in 1896, the following paper was read:

HINTS ON THE CULTIVATION OF THE CANNA, TUBEROUS BEGONIA, SWEET PEA, AND CHRYSANTHEMUM.

By L. Woolverton.

Canna.—I do not think cannas have yet been grown very much about Grimsby, and yet they are one of the best plants for the lawn. Massed in the rear of the pleasure ground, their tropical appearance and stately habit of growth, with their tall spikes of fiery bloom, they have a very fine effect. I am glad our Society is being the means of introducing this excellent plant into more general cultivation, and, as a result of the little packages being distributed to-night, I hope to see many lawns and gardens in Grimsby made attractive with magnificent beds of cannas.

Cannas are easy of cultivation. The great points to be observed are rich soil, moisture and sunlight. Like the dahlia, they need to be started early in March or April in the house or in a hot-bed, and then when all danger from frost is over, they may be planted out in the open ground. Plant in rich soil, working in plenty of manure first. Be sure there is no shade, and keep the soil well stirred up. If the season is dry, give a liberal quantity of water in the evening, and you will be rewarded with a brilliant show of bloom.

The flowers of the canna have been much improved of late through the efforts of M. Crozy, the French hybridist. The variety named after him is still one of the best, some of the blooms reaching a diameter of six inches. Other good varieties are Star of 1891, and Crown Jewel. The varieties distributed this year by the Ontario Fruit Growers' Association are unnamed hybrids, many of them being hybrids of Madame Crozy. These will do well for our first experience with cannas, and another year we should try some named varieties

The canna may also be grown in the window garden. For this purpose it should be started in the fall in six-inch pots in a warm, sunny window, with plenty of water. When pot-bound, remove to ten-inch pots, in which they will bloom freely. In the spring, plant them in the open ground and they will recover their vigor and be ready for blooming next winter.

Tuberous Begonia. I have had no success with this flower as yet, but I hope that I have learned enough from past failure to succeed during the coming season. The bulbs should be planted in pots one-half inch larger all around than the bulb itself, and scarcely deep enough to be out of sight. They should be then kept in a warm dark place until the roots have formed, and then afterwards brought to the light in a temperature of about sixty degrees. In about six weeks after the tubers start to grow, they should be shifted into five-inch pots and left in them to bloom, giving plenty of water and shading them from the hot sun. Bulbs of this flower were distributed by our Society a year ago, and very many members reported failure through mismanagement, If there are any who had success, we hope they will report to-night and describe the treatment they gave them.

Sweet Pea. The sweet pea is one of the popular flowers of the present day, and very appropriately has been placed in the list distributed among the members of our progressive society. It is not a new flower. About two hundred years ago it was introduced into England from Sicily, but in those days there were only two varieties, known as the White Sweet Pea and the Painted Lady. Though much prized for its perfume and beauty, it is only of late years that it has become a special favorite, and its present popularity is largely due to that sweet pea specialist, Mr. Henry Eckford, of Shropshire, England, who has given the world a large number of improved varieties. The greatest American sweet pea genius is Mr. W. T. Hutchins, who wrote "All about Sweet Peas," and the largest grower in the world is Mr. W. C. Moore, of California, whose sweet pea garden covers 250 acres. I take it none of us will ever want to grow so many as that, but if every member succeeds with his or her ounce of seeds, the sweet pea will be the flower in Grimsby in 1896. How shall we succeed best then?

1. By choosing a *suitable place*, not too prominent. It is a modest flower, and will be best planted at the side or rear of the house and allowed to ramble about upon chicken wire fence, over bushes, or, if you choose to take the trouble, a neat wire trellis may be built on purpose for its accommodation. Under favorable conditions it will often climb up as high as four or five feet, or sometimes more.

2. *Your soil must be rich and moist.* Thin dry soil, such as many of us have tried them on, the writer among the number, is unsuitable and will produce only failure. Such soils must have plenty of manure and plenty of water to give any good results at all.

3. *Cultivate well* until blooming time. Then, if sown thickly, thin the plants to six or seven inches apart.

4. *Plant deep.* Make drills from four to six inches deep and after sowing cover the seeds with about an inch of soil, drawing in the earth as they grow until the furrows are full.

5. *Sow early.* Any time in April will do in this latitude. Like garden peas, they are very hardy and may be given an early start with perfect safety.

6. *Pick pods* as soon as formed, or rather keep the flowers picked so closely that no pods will form.

As to varieties, Professor Bailey recommends the following as the six best: Blanch Ferry, Apple Blossom, Emily Henderson, Mrs. Gladstone, Butterfly and Countess of Radnor.

CHRYSANTHEMUMS. Since we have two named varieties of chrysanthemums on our distribution list, it is important that we consider how to plant them to obtain the best results. Any one who has attended the chrysanthemum shows, brilliant with their profusion of magnificent blooms of immense size and peculiar character, such as have been held in our cities during the past few years, will be full of enthusiasm over the possibilities in store before us in entering upon the growing of chrysanthemums, and will unite with me in the hope that our society will be able to attempt a chrysanthemum show of our own on a small scale in the autumn of 1897, if not before.

The little plants now given you should be planted at once in three-inch pots in good rich soil. Rotten sod enriched with one-third manure makes the best kind of potting soil. Be sure to firm the earth well about the roots of the plants, water and then fill up with loose earth. Set them in the shade for a few days and afterwards bring them to a sunny window. From the first to last the chrysanthemum needs an abundance of water and plenty of sunshine. As soon as the roots of the plant reaches the sides of the pot, shift to a pot six inches in diameter. This transplanting can be done without any shock to the growth of the plant, because a ball of earth will remain attached.

Sometime in June when conditions are favorable to growth, the plants may be set in the open ground for the summer, and lifted into larger pots, say nine inches in diameter, sometime in September in which they may be left to bloom. Another plan is to shift them into larger sized pots in the month of June, instead of planting them in the open ground, and to set these pots in a bed of coal ashes, where they may remain until about the first of October when they should be housed. If rain is lacking, water them frequently and never allow them to remain dry.

If you want fine blooms, one important point is thinning the buds. The enormous specimens which we see at chrysanthemum shows have been produced by removing all buds except the one which is to produce the exhibition bloom, and thus the whole strength of the plant is thrown into the one bloom. But for ordinary purposes, this method is not desirable. A better plan is simply to pinch back the leading shoot so as to secure free branching, then allow one terminal bud on each branch to mature a bloom. It is better to do this than to allow all the buds in a cluster to produce flowers.

After blooming is over, cut down the stem to within six inches of the ground and winter in the cellar. The name of the variety may be written on the pot.

I have thus attempted to give you a few brief directions for the cultivation of these flowers which we are distributing during the present season, directions which I am sure will be of as much value to myself as to any other member of this society. We hope to learn much by reading. by experience and by comparing notes with each other at our meetings, and trust that, as a result, greater skill in the production of beautiful flowers will be attained by the members of our society.

KINCARDINE.

President, A. C. Washburn; *First Vice-President*, George Sturgeon; *Second Vice-President*, Mathew McCreath; *Secretary-Treasurer*, Joseph Barker.

Directors:—W. M. Dack, E. Miller, Dr. Jno. McCrimmon, S. H. Perry, R. Malcolm, N. McPherson, A. Campbell, P. S. I., Jno. Ruettel and A. Lutterell; *Auditors*, Andrew Malcolm and John H. Leongall.

LINDSAY.

OFFICERS FOR 1896: *President*, W. M. Robson; *Vice-President*, Alex. Cathro; *Second Vice-President*, R. Chambers; *Secretary-Treasurer*, T. J. Frampton.

Directors:—W. King, Jos. Cooper, Alex Skinner, T. Bryant, Jos. Rickaby, Thos. Connolly, T. Harrington, W. H. Stevens, J. H. Knight.

MEAFORD.

OFFICERS FOR 1896: *President*, Oscar Boden, Esq.; *First Vice-President*, Chas. Ellis, Esq.; *Second Vice-President*, Capt. Geo. Sutherland; *Secretary-Treasurer*, A. McK. Cameron; *Auditors*, F. Abbott, Esq. and C. H. Jay, Esq.

Directors.—D. A. Ferguson, A. Tait, T. Plunkett, G. G. Albery, Jas. Trout, N. Snider, W. T. Moon, A. Gifford, and Innes Stewart.

NIAGARA FALLS.

OFFICERS FOR 1897:—*President*, W. P. Lyon; *Vice-President*, Roderick Cameron; *Second Vice-President*, Thomas Berriman; *Secretary*, E Morden; *Treasurer*, J. G. Cadham. *Directors*, Mrs. A. Land, Mrs. James Neilson, Mrs. McNally, Miss Willox, George A. Pyper, George Law, Rev. Canon Bull.

This active flourishing society numbered over 100 members in 1896, and over fifty members already for 1897.

On March 10th, 1896, a show of house plants was made. A. McNeill, of Windsor, James Sheppard, of Queenstown, and T. Greiner, of LaSalle, N.Y., delivered instructive addresses, and a large audience heard them.

On June 18th, the Society, with many excursionists, visited Guelph. On August 27th a very fine exhibition, in which Begonias much abounded, was held. An orchestra in the evening was much appreciated; many members exhibited plants and flowers. Pomegranates, Wild Grapes and some very fine Japan Plums figured among the fruits. In November the Society gave a very fine Chrysanthemum exhibition to all comers, free of cost. The Society holds business meetings on the second Monday of each month. On the third Monday they hold open meetings to which all members and their friends are invited. Essays, lectures and discussions are in order. Fruit and flowers for name are brought to the meetings. A small flower show is often an attractive feature.

PORT DOVER.

President, James Symington; *1st Vice-President*, H. Holden; *2nd Vice-President*, Wm. Stamp; *Secretary-Treasurer*, W. J. Carpenter. *Directors*, D. Woolley, Wm. Duncan, B. Bowlby, Wm. Corbett, C. Fairchild, R. Fleming, George C. Ryerse, A. G. Rose and W. J. Carpenter; *Auditors*, L. G. Morgan and S. Maneer.

A touching tribute of respect for the memory of the first Vice-President, the late Mr. C. C. Olds, was paid by several members present, and the Secretary was instructed to forward a letter of condolence to the relatives of the deceased.

The Society was inaugurated last February (1896) with only about a dozen members. Since then, owing to the activity of its officers and members, it has now the full complement required by the law to entitle it to the Government bonus of $100, which will help not a little to increase the efficiency and influence of the organization during the coming year. Its members comprise a good many of the most prominent and influential fruit growers and others in the district, and if the present interest in it is kept up it will prove of great value to the community. All members are entitled to a copy of the *Canadian Horticulturist*, recently enlarged and improved; also to a copy of the annual report of the Ontario Fruit Growers' Association, and a choice of one of the following: 1. New Japan Lilac; 2. Lilium Speciosum Roseum; 3. Conrath Raspberry; 4. Dempsey Pear, which is a cross between a Bartlett and a Duchess.

PICTON.

OFFICERS FOR 1897 :—*President*, Thomas Bog ; *1st Vice-President*, H. T. Hopkins ; *2nd Vice-President*, Mrs. A. M. Terrill ; *Secretary-Treasurer*, Walter T. Ross. *Directors*, John Richards, Wellington Boulter, Mrs George W. McMullen, Mrs. H. W. Branscombe, John Davis ; *Auditors*, J. F. Gillespie, Alex. McDonald.

The present number of members is sixty-six.

PORT COLBORNE.

President, E. O. Boyle ; *1st Vice-President*, W. W. Knisley ; *2nd Vice-President*, Rev. J. M. Smith ; *Secretary-Treasurer*, A. E. Augustine. *Directors*, J. C. McRae, S. J. McCoppen, Fred Hoschke, D. W. McKay, J. H. Smith, A. E. Augustine, Mrs. J. Steele, Mrs. Peter Welsh and Mrs. Menno Moyer ; *Auditors*, Messrs. S. J. Hopkins and E. B. Milliken.

There was a gloom cast over the meeting, as one of the most active and influential members has passed away in the person of Mr. L. G. Carter who died on December 30th, at his residence "Rose Lawn." It was through Mr. Carter's efforts, that a Horticultural Society was organized here in 1895, and he was 1st Vice-President at the time of his death.

The following resolution of sympathy to Mrs. Carter was moved by Mr. W. W. Knisley, and seconded by Mr. E. B. Milliken.

Resolved, that this society desires to place on record its sincere sorrow for the loss of Mr. L. G. Carter, who for so many years took a prominent and public spirited part in all undertakings tending to promote the progress and welfare of this community, and whose name is honorably indentified with the history of this locality during the greater portion of his long and useful life and promoter of this society. That a copy of this resolution be extended to Mrs. Carter and the bereaved family and also published in the *Canadian Horticulturist* and *Welland Tribune* and *Telegraph*.

PORT HOPE.

OFFICERS FOR 1897 :—H. H. Burnham, *President ;* Wm. Craig, *1st Vice-President ;* P. Brown, *2nd Vice-President ;* A. W. Pringle, *Secretary-Treasurer*. *Directors*, John Smart, W. W. Renwick, T. G. Watson, Thos. Wickett and Samuel Purser. The following ladies were appointed Sub-Directors and Advisory Board :—Mrs. T. M. Benson, Mrs. H. H. Burnham, Mrs. James Robertson, Mrs. H. M. Rose, Miss Choate, Miss Evans.

SMITH'S FALLS.

OFFICERS FOR 1897 :—*President*, J. S. McCallum, M D ; *1st VicePresident*, Elliott Ballantyne ; *2nd Vice-President*, Mr. Geo. Steele. *Directors*—Mrs. J. S. Foster, Mrs. W. M. Richey, Mrs. G. F. McKinnon, Miss. Alice Gould, J. M. Clark, J. A. Houston, John Rabb, R. Milliken, John Clark.

SIMCOE.

OFFICERS FOR 1897 :—*President*, Rev Canon Young ; *1st Vice-President*, J. H. Ansley ; *2nd Vice-President*, H. H. Groff ; *Secretary-Treasurer*, Henry Johnson ; *Directors*—Henry Johnson, Albert Gilbert, Joseph S. Wychoff, Daniel Matthews, W. E. Tisdale, John A. Campbell, Harry A. Carter, Geo. J. McKill, Thos. Hoddow ; *Auditors*—H. B. Donly, W. D. Boyd.

WATERLOO.

The second anuual meeting of the Waterloo Horticultural Society was held on Wednesday evening, January 13th, in the old Council chamber. There was a good attendance, including a number of ladies. Mr. J. Lockie, the president, occupied the chair The Secretary read the minutes of the previous meeting, which were confirmed. The Directors' report, which is subjoined, was read by the President, and the financial statement by the Secretary. The reports were adopted.

The following office-bearers were elected for the ensuing year:—*President*, James Lockie, *1st Vice-President*, Chas. Moogk; *2nd Vice-President*, Mrs. P. Hohmeier. *Directors*—Mrs. Dr. Webb, Miss M. Bruce, Mrs. P. Gleiser, Messrs. George Bolduc, C. M. Taylor, J. H. Ross, W. A. Raymo, A. Weidenhammer; *Secretary-Treasurer*, J. H. Winkler; *Auditors*, Geo. Davidson and L. W. Shuh.

Directors' Report.

Your Directors, in making their second annual report, have much pleasure in congratulating the members on the continued success of this Society, our membership having increased to 125 the past year, each of whom received *The Canadian Horticulturist* and bound report, and we distributed in premiums 61 cherry trees, 61 plum trees, 61 pear trees, 23 spireas, 23 roses, 23 clematis, 96 cannas, 32 Dahlias, 320 gladioli, 312 house plants and 1,500 hyacinth bulbs.

The open meetings for discussion and talks on plants, fruits and flowers, have been kept up during the year, and we believe have been profitable.

On the 17th of March last the Fruit Growers' Association sent Mr. D. W. Beadle, the well known horticulturist, here who delivered an excellent lecture on "The Garden" in the Town Hall to a good audience, who showed their appreciation and interest in the subject by a number of questions at the close of the lecture.

On the 20th and 21st August the annual free exhibition of flowers, fruit and vegetables, was held in the Town Hall, and was in every respect a success. At exhibitions, where prizes are given, each class must be arranged together for comparison, but in this all were placed for effect; flowers were arranged with foliage and decorative plants, so that the beauties of all were brought out in the best manner. The arrangement of these by the ladies was admired by all, and we do not think could have been improved on.

The season having been more favorable, the exhibition of fruits and vegetables was greatly in advance of the previous year.

We found that keeping the exhibition open for two days instead of one as heretofore was a great gain, giving more time and opportunity to examine and discuss the exhibits.

The second afternoon was specially children's day, as your Directors feel that to interest the young in such things is the best guarantee of future interest and improved taste in this direction. On both evenings the hall was crowded with interested and delighted visitors. Your Directors feel that this manner of conducting the affairs of this Society (as advised by Mr. Beall) at its organization), by having its exhibitions free in every respect, no prizes, nor admission fee, but open to all is altogether the best plan, and fully carries out the intention of the Government in assisting these societies. Where prizes are given or admission charged only a few are benefited, but in this way it is made a public benefit and a practical educator.

Your Directors have much pleasure in stating that the annual meeting of the Ontario Fruit Growers' Association will be held in the Town Hall here in December next, to discuss the important question of "How to make fruit growing profitable." The leading fruit growers of Canada will be present and take part, and we trust each member of this Society will use every influence to insure a large attendance during the three days' session, and especially try and induce the farmers to attend, as the information in regard to fruit growing is certain to be of great value to all.

The reports of the Secretary-Treasurer and Auditors are before you, and we trust our successors now to be elected, and our citizens generally, will continue as hitherto to support and assist in the good work of the Waterloo Horticultural Society.

By order of the Board,

JAS. LOCKIE, President.

WATERLOO, Jan. 13th, 1897.

Financial Report.

RECEIPTS.		EXPENDITURE.	
Balance on hand from 1895	$97 85	D. W. Beadle	$1 00
Members' fees	125 00	Freight	1 86
Sale of bulbs	5 00	H. H. Groff	12 00
Government grant	94 00	Grimsby Nursery	49 38
		Webster Bros.	15 04
		Fruit Growers' Association	25 00
		Exchange	80
		J. Lockie, bulbs	64 13
		Hoffman and others	6 45
		Printing	15 00
		Fruit Growers' Association	75 00
		Exchange	25
		Bricker & Diebel, cotton bags	2 87
		Balance on hand	53 07
Total	$321 00	Total	$321 85

WOODSTOCK.

OFFICERS FOR 1897 :—*President*, D. W. Karn ; *1st Vice-President*, G. R. Pattullo ; *2nd Vice-President*, W. H. Van Ingen ; *Treasurer*, J. S. Scarff ; *Secretary*, R. B. Thornton ; *Directors*—E. Hersee, Frank Harris, J. Silcox, F. Mitchell, Fred. Dunn, E. W. Snelgrove, M. S. Schell, T. H. Parker and W. Newton ; *Auditors*—J. Pike and T. L. Clarkson.

CONSTITUTION AND BY-LAWS OF THE ASSOCIATION.

CONSTITUTION.

Art. I. This Association shall be called "The Fruit Growers' Association of Ontario."

Art. II. Its object shall be the advancement of the science and art of fruit culture by holding meetings for the exhibition of fruit and for the discussion of all questions relative to fruit culture, by collecting, arranging, and disseminating useful information, and by such other means as may from time to time seem advisable.

Art. III. The annual meeting of the Association shall be held at such time and place as shall be designated by the Association.

Art. IV. The officers of the Association shall be composed of a President, Vice-President, a Secretary, or Secretary-Treasurer, and thirteen Directors.

Art. V. Any person may become a member by an annual payment of one dollar, and a payment of ten dollars shall constitute a member for life.

Art. VI. This Constitution may be amended by a vote of the majority of the members present at any regular meeting, notice of the proposed amendments having been given at the previous meeting.

Art. VII. The said Officers and Directors shall prepare and present at the annual meeting of the Association, a report of their proceedings during the year, in which shall be stated the names of all the members of the Association, the places of meeting during the year, and such information as the Association shall have been able to obtain on the subject of fruit culture in the Province during the year. There shall also be presented at the said annual meeting a detailed statement of the receipts and disbursements of the Association during the year, which report and statement shall be entered in the journal and signed by the President as being a correct copy; and a true copy thereof, certified by the Secretary for the time being, shall be sent to the Minister of Agriculture within forty days after the holding of such annual meeting.

Art. VIII. The Association shall have power to make, alter and amend By-Laws for prescribing the mode of admission of new members, the election of officers, and otherwise regulating the administration of its affairs and property.

BY-LAWS.

1. The President, Vice-President and Secretary-Treasurer shall be *ex-officio* members of all committees.

2. The Directors may offer premiums to any person originating or introducing any new fruit adapted to the climate of the Province which shall possess such distinctive excellence as shall, in their opinion, render the same of special value; also for essays upon such subjects connected with fruit growing as they may designate, under such rules and regulations as they may prescribe.

3. The Secretary shall prepare an annual report containing the minutes of the proceedings of meetings during the year; a detailed statement of receipts and expenditure, the reports upon fruits received from different localities, and all essays to which prizes have been awarded, and such other information in regard to fruit culture as may have been received during the year, and submit the same to the Directors or any Committee of Directors appointed for this purpose, and, with their sanction, after presenting the same at the annual meeting, cause the same to be printed by and through the Publication Committee, and send a copy thereof to each member of the Association and to the Minister of Agriculture.

4. Seven Directors shall constitute a quorum, and if at any meeting of Directors there shall not be a quorum, the members present may adjourn the meeting from time to time until a quorum shall be obtained.

5. The annual subscription shall be due in advance at the annual meeting.

6. The President (or in case of his disability, the Vice-President), may convene special meetings at such times and places as he may deem advisable; and he shall convene such special meetings as shall be requested in writing by five members.

7. The President may deliver an address on some subject relating to the objects of the Association.

8. The Treasurer shall receive all moneys belonging to the Association, keep a correct account thereof and submit the same to the Directors at any legal meeting of such Directors, five days' notice having been previously given for that purpose.

9. The Directors shall audit and pass all accounts, which, when approved of by the President's signature, shall be submitted to and paid by the Treasurer.

10. It shall be the duty of the Secretary to keep a correct record of the proceedings of the Association, conduct the correspondence, give not less than ten days' notice of all meetings to the members, and specify the business of special meetings.

11. The Directors, touching the conduct of the Association, shall at all times have absolute power and control of the funds and property of the Association, subject however to the meaning and construction of the Constitution.

12. At special meetings no business shall be transacted except that stated in the Secretary's circular.

13. The order of business shall be: (1) Reading of the minutes; (2) Reading of the Directors' Report; (3) Reading of the Treasurer's Report; (4) Reading of the prize essays; (5) President's Address; (6) Election of officers, and (7) Miscellaneous business.

14. These By-laws may be amended at any general meeting by a vote of two-thirds of the members present.

15. Each member of the Fruit Committee shall be charged with the duty of accumulating information touching the state of the fruit crop, the introduction of new varieties, the market value of fruits in his particular section of the country, together with such other general and useful information touching fruit interests as may be desirable, and report in writing to the Secretary of the Association on or before the fifteenth day of September in each year.

The President, Vice-President and Secretary shall be *ex-officio* members of the Board of Directors and of all Committees. The reasonable and necessary expenses of Directors and officers in attending meetings of the Board of Directors and of Committees shall be provided from the funds of the Association.

Local Fruit Growers' Association.

16. It shall be the duty of the officers and directors of the Fruit Growers' Association of Ontario to encourage the formation of local fruit growers' horticultural societies in affiliation with the Ontario Association.

17. Any one may become a member of such local society for one year upon payment into its treasury of a minimum sum of one dollar; and a compliance with clause 18 of these by-laws shall constitute him also a member of the Ontario Association for the same term.

18. On the receipt of the names of such members, with the required fees, the secretary of such local affiliated society may transmit their names and post office addresses, together with the sum of eighty cents for each to the Secretary of the Fruit Growers' Association of Ontario, who will enter their names as members of that society, entitled to all its privileges, providing the initial number of such names be not less than ten.

19. Each local society so affiliating, with a membership of not less than twenty-five, shall be entitled to a visit from some member of the board of directors or other prominent horticulturist, once a year, at their own request; it being understood that the railway expenses of such speaker shall be paid by the Ontario Society, and the entertainment provided by the local society.

20. The proceedings of such local fruit growers' horticultural societies shall, on or before the 1st day of December of each year, to be forwarded to the secretary of the Ontario Society, who may cull out such portions for the Annual Report to the Minister of Agriculture for the province, as may seem to him of general interest and value.

21. These local societies, if formed in cities, towns or incorporated villages, may be formed under the Agriculture and Arts Act (see sections 37, 46 and 47) and receive their due share of the Electoral District grant for the support of such societies.

22. Each local affiliated society is further expected to send at least one delegate to the annual meeting of the Fruit Growers' Association.

The Director of the Fruit Growers' Association of Ontario of the Agricultural District in which such society is formed, shall be *ex-officio*, a member of the executive committee of such local society and receive notices of all its meetings.

AGRICULTURAL DIVISIONS.

1. Stormont, Dundas, Glengarry, Prescott, and Cornwall.

2. Lanark North, Lanark South, Renfrew North, Renfrew South, Carleton, Russell, and the city of Ottawa.

3. Frontenac, city of Kingston, Leeds and Grenville North, Leeds South, Grenville South, and Brockville.

4. Hastings East, Hastings North, Hastings West, Addington, Lennox, and Prince Edward.

5. Durham East, Durham West, Northumberland East, Northumberland West, Peterborough East, Peterborough West, Victorio North (including Haliburton), and Victoria South.

6. York East, York North, York West, Ontario North, Ontario South, Peel, Cardwell, and city of Toronto.

7. Wellington Centre, Wellington South, Wellington West, Waterloo North, Waterloo South, Wentworth North, Wentworth South, Dufferin, Halton, and city of Hamilton.

8. Lincoln, Niagara, Welland, Haldimand, and Monck.

9. Elgin East, Elgin West, Brant North, Brant South, Oxford North, Oxford South, Norfolk North, and Norfolk South.

10. Huron East, Huron South, Huron West, Bruce North, Bruce South, Grey East, Grey North and Grey South.

11. Perth North, Perth South, Middlesex East, Middlesex North, Middlesex West, and city of London.

12. Essex North, Essex South, Kent East, Kent West, Lambton East, and Lambton West.

13. Algoma East, Algoma West, Simcoe East, Simcoe South, Simcoe West, Muskoka, Parry Sound East, Parry Sound West, Nipissing East, Nipissing West, and Manitoulin.

INDEX.

THIRD ANNUAL REPORT

OF THE

FRUIT EXPERIMENT STATIONS

OF

ONTARIO

UNDER THE JOINT CONTROL OF THE

ONTARIO AGRICULTURAL COLLEGE, GUELPH,

AND THE

FRUIT GROWERS' ASSOCIATION OF ONTARIO,

1896.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF THE
LEGISLATIVE ASSEMBLY OF ONTARIO.

TORONTO:
WARWICK BRO'S & RUTTER, PRINTERS, &C., &C., 68 AND 70 FRONT STREET WEST.
1897.

THIRD ANNUAL REPORT

OF THE

ONTARIO FRUIT EXPERIMENT STATIONS

1896.

To the Honorable John Dryden, Minister of Agriculture for Ontario:

SIR,—This report is submitted for your approval, believing you will see in it evidences of considerable progress in the work of testing varieties by our stations. Most of the experimenters already had a considerable collection of fruits on their grounds before undertaking this work for the public good, and are therefore prepared to give useful information from the first, regarding varieties.

Experimental work proper, dealing with the effect of different soils, fertilizers, spraying, etc., upon the yield and vigor of trees and vines, is being also undertaken, but reports of such work must necessarily be the work of years of patient experiment and exact records.

We have the honor to be, Sir,

Your obedient servants,

JAMES MILLS,
Chairman.

L. WOOLVERTON,
Secretary.

BOARD OF CONTROL, 1897.

REPRESENTING THE COLLEGE.

JAMES MILLS, M.A., LL.D., Guelph ..... President.
H. L. HUTT, B.S.A., Guelph ..... Horticulturist.

REPRESENTING THE FRUIT GROWERS' ASSOCIATION FOR 1897.

A. M. SMITH ..... St. Catharines.
A. H. PETTIT ..... Grimsby.
W. E. WELLINGTON ..... Toronto.
L. WOOLVERTON, M.A., Secretary ..... Grimsby.

EXECUTIVE COMMITTEE

Chairman—JAMES MILLS, M.A., LL.D.
Secretary—L. WOOLVERTON, M.A.
Official Visitor—H. L. HUTT, B.S,A.

THE ONTARIO FRUIT EXPERIMENT STATIONS.

Name.	*Specialty.*	*Experimenter.*
1. Southwestern	Peaches	W. W. HILBORN, Leamington, Ont.
2. Niagara	Tender Fruits	Martin BURRELL, St. Catharines, Ont.
3. Wentworth	Grapes	M. PETTIT, Winona, Ont.
4. Burlington	Blackberries and Currants	A. W. PEART, Freeman, Ont.
5. Lake Huron	Raspberries and Commercial Apples.	A. E. SHERRINGTON, Walkerton, Ont.
6. Georgian Bay	Plums	John G. MITCHELL, Clarksburg, Ont.
7. Simcoe	Hardy apples and hardy cherries	G. C. CASTON, Craighurst, Ont.
8. East Central	Pears and Commercial Apples.	R. L. HUGGARD, Whitby, Ont.
9. Bay of Quinte	Apples	W. H. DEMPSEY, Trenton, Ont.
10. St. Lawrence	Hardy Pears, Hardy Plums.	Harold JONES, Maitland, Ont.
11. Strawberry sub-station		E. B. STEVENSON, Guelph.
12. Gooseberry sub-station		S. SPILLETT, Nantye.
13. Cherry station and General collection of fruits for descriptive work	Cherries	L. WOOLVERTON, Grimsby.

CONTENTS.

APPENDIX.

INDEX.

FRUIT EXPERIMENT STATIONS OF ONTARIO.

FRUITS OF ONTARIO

Described and Illustrated by Mr. L. Woolverton, Secretary of the Ontario Fruit Experiment Stations.

Fruit growing has become so important an industry in the Province of Ontario, that it deserves every encouragement at the hands of the Department of Agriculture. The Canadian farmer who contemplates growing fruit asks for information on two points in particular, viz., (1) What fruits shall I plant, and (2) how shall I cultivate them ? The latter of these questions it is the province of the Ontario Fruit Growers' Association to answer through the Canadian Horticulturist and the Annual Report, while the former question is one that can be solved only by years of patient experimental work by our fruit experiment stations

Of equal importance is some means of identifying all varieties now grown in our Province, and of knowing with some degree of exactness the size, color, general appearance and real value of these varieties aside from the catalogues of the nurserymen. To meet this latter need, the Secretary, with the advice and approval of the Board of Control, has begun the work of illustrating and describing the fruits of Ontario. The illustrations are all new and original, having been engraved from photographs made the exact size of the fruit samples, except where otherwise specified, and in this way there will in time be made access ble to the Ontario fruit growers a complete guide to all the fruits grown in the Province. Such a work necessarily must be slow and tedious, but it is all important that it should be characterized by scientific accuracy, and the writer invites notes or criticism from pomologists generally.

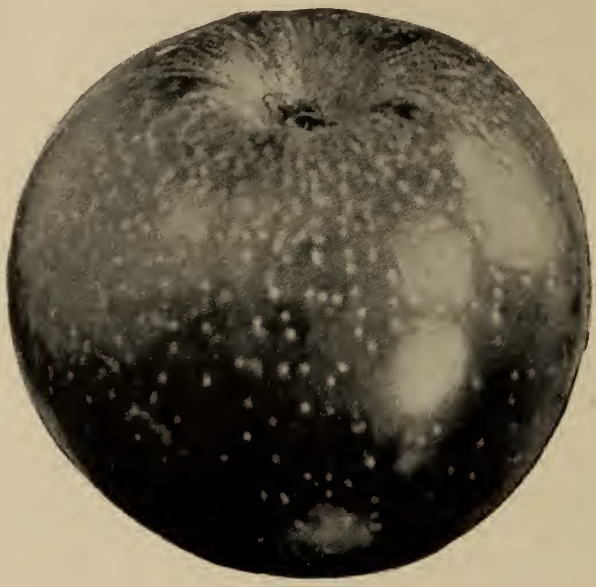
JAMES MILLS, M.A.,
Chairman.

L. WOOLVERTON,
Secretary.

APPLES.

Baldwin. (*Steele's Red Winter*).

The Baldwin originated in the State of Massachusetts and was for many years the most popular winter apple for either home or foreign markets. The average yield each alternate year was about eight barrels per tree, and in some instances much larger. Large orchards of this variety were in consequence planted in the apple growing counties of middle and southern Ontario, but unfortunately for many years now these orchards have been almost barren, and many of them are being dug out as worthless. The cause may be poverty of soil, the lack of pollen of other varieties to fertilize the blossoms, or the prevalence of apple scab. If it is the latter, it may be overcome with the Bordeaux mixture; if lack of potent pollen, by grafting in other varieties here and there through the orchard.



Baldwin.

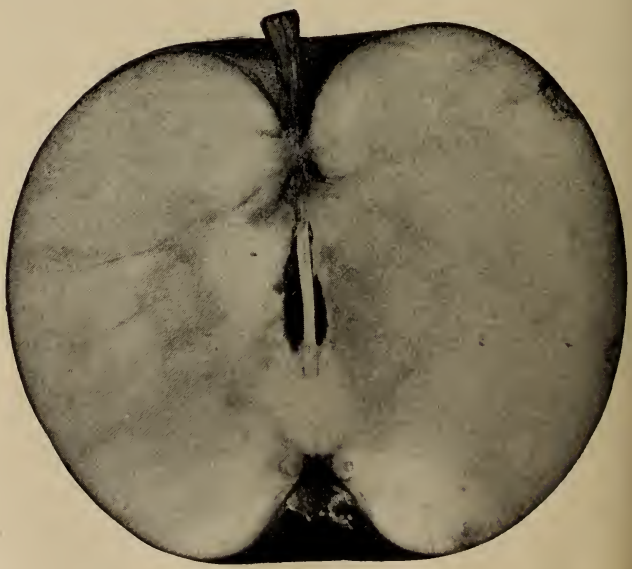
Tree, upright, spreading, vigorous grower, formerly very productive.

Fruit, large, roundish, ovate; skin yellow, shaded and splashed with crimson and red, dotted with some russet dots; stem heavy, three-quarters of an inch long, in a broad cavity; calyx, closed, in a deep plaited basin.

Flesh, yellowish white, tender, sub-acid; quality, second class.

Season of use, January to March.

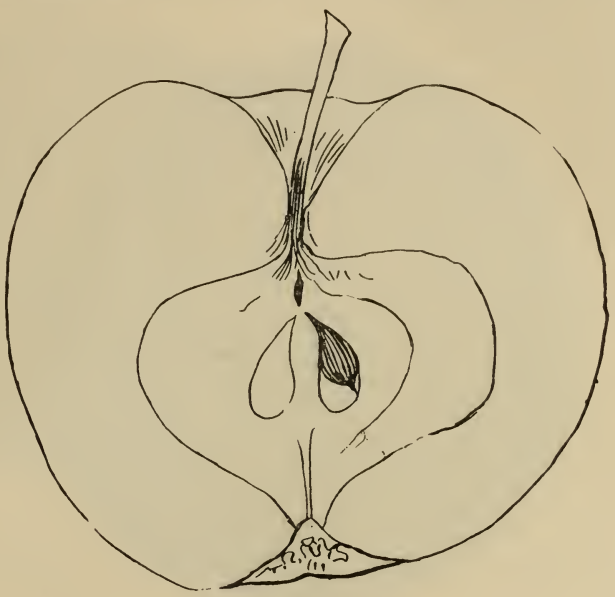
Adaptation. Not very hardy at Simcoe station or in North Ontario county; further south and along the borders of the lakes, this apple may be grown to perfection, if the scab can be kept off the trees.



Section of Baldwin.

CABASHEA. (*Twenty Ounce Pippin*).

Not worth planting in Ontario. Through confusing its name with that of the Cayuga Red Streak, often called Twenty Ounce, this apple has been widely planted in our Province. The tree is unproductive and the fruit, though large and fine in appearance, drops early and is poor in quality. Twenty trees, at Maplehurst, twenty years planted, yielded about ten barrels of apples in 1895, the best so far.

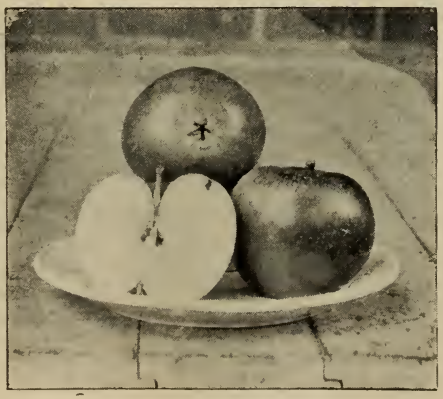


SECTION OF CABASHEA.

ORIGIN, unknown.

TREE, vigorous, spreading, unproductive.

FRUIT, large, roundish, oblate, slightly conical; skin, yellowish green, shaded with dull red on the sunny side; stem, an inch long, stout, in a wide cavity of moderate depth; calyx open in a wide shallow basin; core medium.



CABASHEA. (Reduced).

FLESH, white, firm, coarse, sub-acid, only fair for cooking, useless for dessert.

SEASON, October to December. At Bay of Quinte station, season given from December to February.

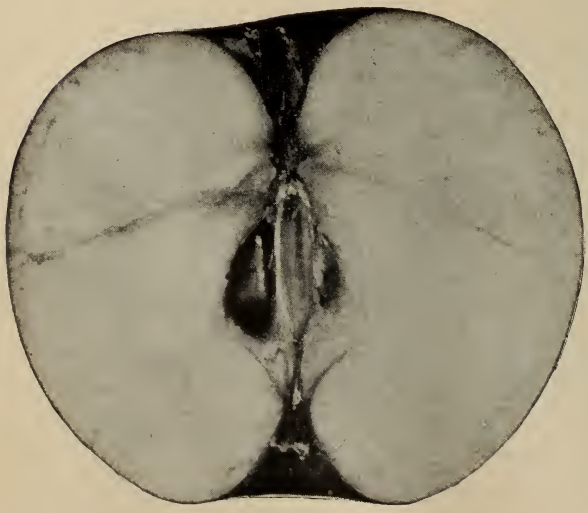
Tested, twenty years at Maplehurst, Grimsby.

Ben Davis

One of the most popular market apples in the southwestern and western states because of its great productiveness, hardiness, good color and its keeping and shipping qualities. Highly valued in some commercial orchards in Canada, but condemned by some growers on account of its inferior quality.

Ben Davis.

At the World's Fair in 1893, some of the finest apples shown by Iowa, British Columbia and Oregon were the Ben Davis. It is a profitable market apple.



Section of Ben Davis.

Origin, brought from North Carolina to Kentucky with a lot of other seedling apples by Mr. Ben Davis. Scions taken from Kentucky to Southern Illinois about 1820.

Tree, spreading, fairly vigorous and very productive.

Fruit, medium to large, roundish, truncated conical, unequal ; color, yellow, striped and splashed with red, having scattered aerole dots ; stem, slender, one to one and a half inches long in a deep cavity ; calyx, erect, partly closed in a deep, wide basin.

Flesh, white, tender, mild subacid.

Quality, dessert, poor ; cooking, fairly good : home market, good ; foreign market, very good.

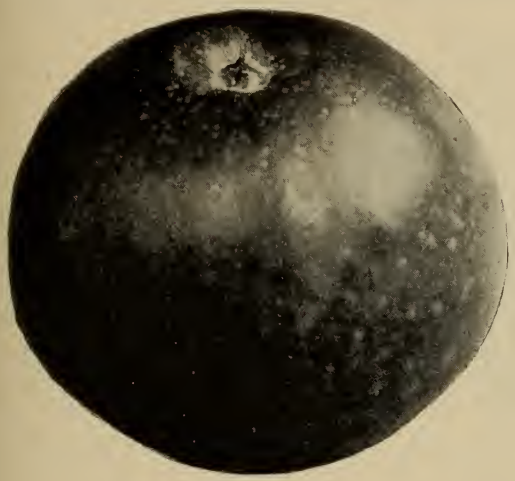
Season, January to May. (Bay of Quinte station.)

Adaptation. Succeeds remarkably well at the Georgian Bay and Bay of Quinte stations.

Canada Red.

(Baltimore of Downing.)

This apple is grown quite widely in Ontario under the name of Canada Red, and is valued as a profitable commercial variety, especially where Baldwin, Spy and Ontario do not succeed ; for, although only medium in size, it yields abundantly and the fruit is deeply colored, regular, clean and firm. There is an old variety of this name, which is now little grown, if at all, in Canada and which, though somewhat similar, is inferior to this variety, and consequently is undeserving of description.



Canada Red.

Origin. Unknown.

Tree. Vigorous, hardy and very productive.

Fruit Medium, roundish, slightly conical, regular ; color, greenish yellow, almost covered with red, sometimes splashed or slightly striped with darker red, having numerous large prominent greenish areole dots, which are smaller towards the apex ; stem, half an inch long in a small deep and often russeted cavity ; calyx small, closed in a shallow slightly corrugated basin.

Section of Canada Red.

Flesh, greenish white, fine grained, firm, moderately juicy ; flavor, fair, mild, sub-acid.

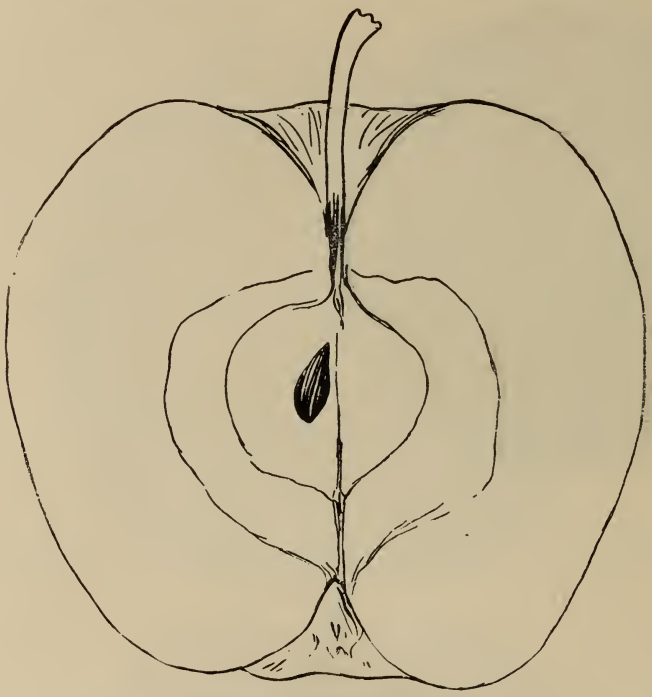
Season, December to May.

Quality, dessert, medium ; cooking, medium ; home market good ; foreign market, very good.

Adatation. Reported hardy as far north as our St. Lawrence station near Prescott ; succeeds at Peterboro' and throughout all middle and southern Ontario.

Cranberry Pippin.

An apple that is worthy of being planted in southern Ontario as a fancy variety for export. Though the quality is ordinary and not suitable for dessert, its extreme beauty when opened in mid-winter, its large and even size, usual freedom from blemishes and the productiveness of the tree every alternate year, make it a desirable variety.



Section of Cranberry Pippin.

At Maplehurst, Grimsby, in 1895, fifty trees of this variety, about twenty years planted, yielded 200 barrels of high grade apples, and in 1893, when other varieties were almost worthless, nearly the same quantity. Sometimes, however, this variety is subject to warts and knots which mar its beauty.

Origin, accidental on a farm, near Hudson River, N.Y.

Tree, very vigorous, healthy, spreading, productive.

Fruit, medium to large, roundish oblate ; skin, smooth, yellow shaded and striped with two shades of red ; stem, slender, one one-eighth inches long in a deep cavity ; calyx closed in a wide, wrinkled basin.

Flesh, white, firm, crisp, moderately juicy, sub-acid,

Quality, fair.

Season, November to February.

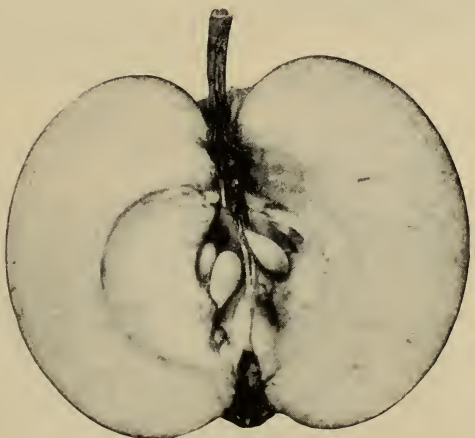
Cranberry Pippin. (Reduced.)

Adaptation. Southern portions of the Province, especially along the shores of the lakes.

Early Harvest.

The best apple of its season both for dessert and cooking, but of late years rendered worthless in Ontario by scab, which not only spoils its appearance but lessens its size and injures its flavor. The Early Harvest and Fall Pippin are the two apples which seem to be least able to resist this terrible fungus, and which most favor its spread. Unless therefore this fungus is checked by spraying with the Bordeaux mixture, this apple must soon be left out of the list of desirable varieties.

Early Harvest.



Section of Early Harvest.

Origin, United States.

Tree, only medium in vigor, never attaining a large size, old trees averaging from one-half to two-thirds the size of Greening trees of the same age ; upright and spreading ; productive, considering the size of the tree and the fruit ; yield of full grown trees averages about four barrels every alternate year.

Fruit, medium round, oblate ; skin, smooth, bright straw color when ripe, with a few faint dots ; stem, short, one-half to three-quarters of an inch, in a medium cavity, often russeted ; calyx closed in a shallow, sometimes slightly plaited basin.

Flesh, white, fine grained, juicy, crisp, tender ; flavor, rich, sprightly, pleasant sub-acid.

Season, first week in August ; in 1896, the last half of July.

Quality, dessert, best ; cooking medium ; home market, very good ; foreign market, useless.

Adaptation. Thrives well on sandy loam in the Niagara district.

Greening.

One of the staple varieties for profit in Ontario orchards. No one variety, except the Baldwin, was more widely planted in our Province previous to 1875, but since that time it has been liable to scab some seasons, especially in cases where proper spraying is neglected. Its color is against it in foreign markets, and yet, as it becomes known, the demand for it increases. It has a tendency to drop early, especially south of Lake Ontario, and, therefore, needs to be gathered in good season, about the first of October, as a rule. Remarkable instances of productiveness have been reported. One large tree at Maplehurst, Grimsby, nearly one hundred years planted, yielded twenty barrels one season, and fifteen barrels another.

Greening.

Origin. Rhode Island.

Tree. Very vigorous, spreading, a crooked grower, fairly hardy, very productive, succeeds well on a great variety of soils.

Fruit, Large, roundish, sometimes a little flattened, regular, unless overgrown; color green, becoming lighter as it ripens, often showing a blush when well exposed to the sun; dots light gray, areole, numerous toward the apex; stem, seven-eighths of an inch long in a smooth, narrow cavity; calyx partly closed in a nearly smooth shallow basin.

Flesh, White, with a greenish tint, yellowing as it matures; texture, fine grained, crisp, juicy, flavor, rich, slightly amomatic, pleasant, sub-acid.

Season, December to February.

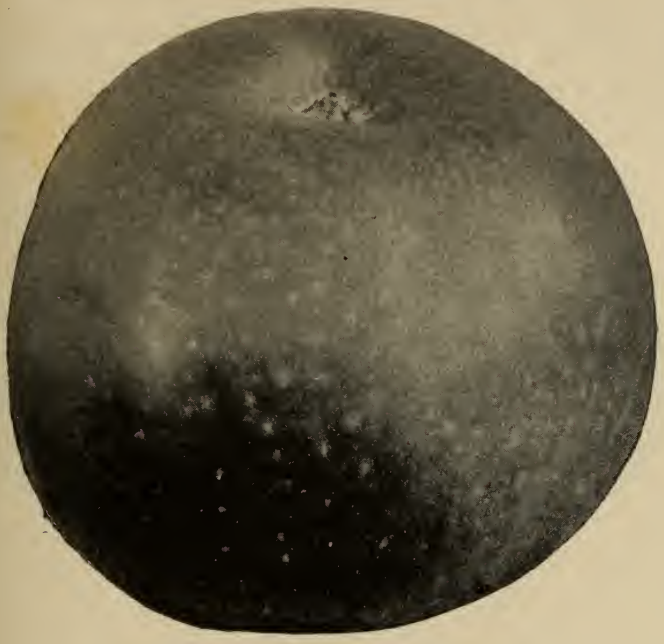
Quality, Dessert, medium; cooking, best; home and foreign markets, good.

Adaptation. Succeeds everywhere, except in northern sections.

Section of Greening.

KING. (King of Tompkin's County.)

Said to have originated in New Jersey. On account of its excellent quality for cooking, its peculiarly rich aromatic flavor, its beautiful appearance and large size, this apple is taking the highest place in the great apple markets of the world. Unfortunately the tree is a poor bearer, and consequently unprofitable as an orchard variety, unless under exceptional circumstances. Top grafted on Tolman Sweet, it is said to be more productive. For home use it is excelled by no apple.



KING.

TREE, a vigorous grower, of spreading habit, but not long-lived.

FRUIT, large, roundish, uneven; skin, yellowish, shading off from red to dark crimson; stem, short and stout, inserted in a wide, deep, somewhat irregular cavity; calyx closed in a broad, shallow, slightly corrugated basin.

FLESH, yellowish, white, crisp and juicy, moderately firm; flavor rich, agreeable, aromatic; quality first-class.

SEASON, October to February in Southern Ontario; reported at the Simcoe station October to March for Northern Ontario.

ADAPTATION. Not hardy at Simcoe station unless top grafted on Tolman Sweet, or some other hardy stock, and, therefore, it is not recommended for planting in northern sections.

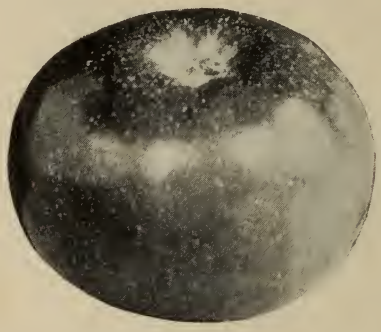
SECTION OF KING.

Lady.

(*In France Api.*)

A beautiful little apple for the amateur's collection, and very highly valued where known for a dessert apple, having a pleasant flavor and great beauty. In Europe the apple is known as Api, but in America it has become known as the Lady apple. Some say it was so called because from its small size and beautiful color, it seemed just suited to a lady's mouth.

Origin, France.



Lady.

Tree, upright habit and bears fruit in clusters, vigorous, only fairly hardy and productive.

Fruit, very small, flat oblate. Color, green turning to yellow, half covered with a rich red cheek, and many tiny dots which are more numerous toward the apex. Stem, slender, half an inch long set in a deep regular cavity. Calyx closed in a small wrinkled basin.

Section of Lady.

Flesh, greenish white, fine grained, crisp and juicy ; flavor, pleasant.

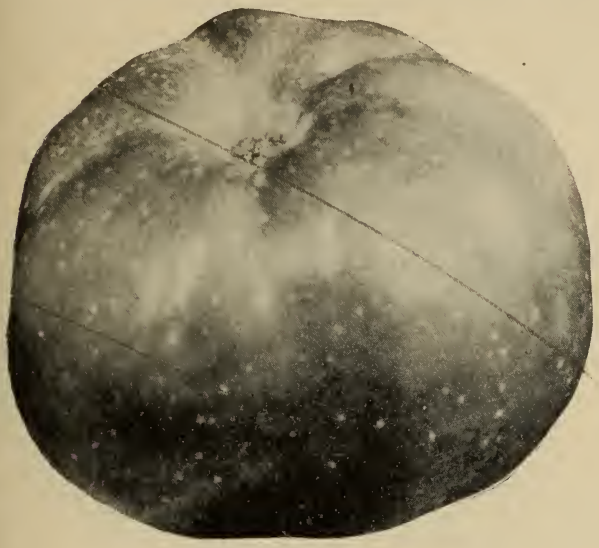
Season, December to May.

Quality, dessert, best ; cooking, too small to be of any value ; market, high value in special markets.

Adaptation. Successfully grown as far north as the Bay of Quinte station.

Ontario.

This is a native of Ontario, as its name indicates, having been raised by crossing Wagener and Spy by the late Charles Arnold of Paris, Ontario, one of the directors of the Ontario Fruit Growers' Association. Its early and abundant bearing, the good quality and even size of the fruit, are the reasons why it is rapidly gaining in favor as an export variety. It has been tested in a commercial way for some years at our Bay of Quinte station, where it is counted one of the best for profit. In 1879 the Ontario was distributed to the members of the Fruit Growers' Association, and favorable reports have been received from counties bordering on the lakes.



Ontario.

Origin, Province of Ontario.

Tree, fairly hardy, moderately vigorous, somewhat spreading, very productive, an early bearer.

Fruit, large, oblate, somewhat ribbed, sides unequal; skin, yellowish, nearly covered with bright red, with a few scattered small white dots with blush bloom; stem, seven-eighths of an inch long, in a deep, russeted, uneven cavity; calyx closed in a moderately deep, corrugated basin.

Flesh, white with green tint, yellowing slightly as it ripens; texture, fine grained, tender, juicy; flavor, mild, sub-acid, sprightly, aromatic.

Season, January to April.

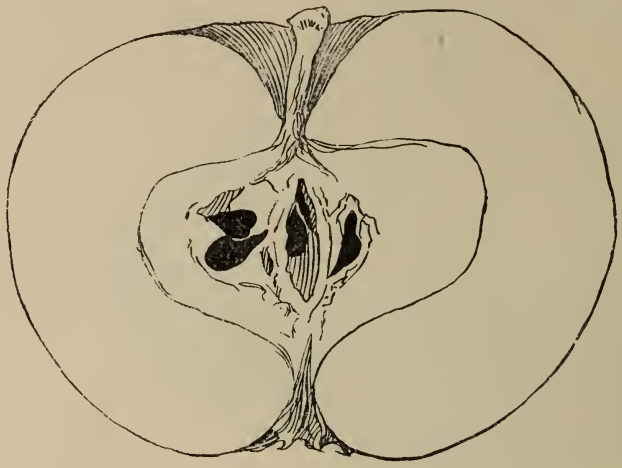
Quality, very good for all purposes.

Section of Ontario

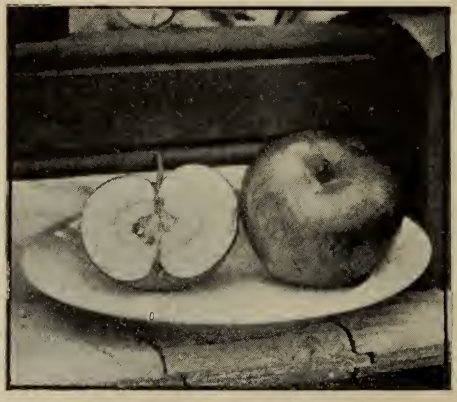
Adaptation. Southern Ontario to north shore of Lake Ontario. Succeeds remarkably well at Bay of Quinte station.

Red Astrachan.

Imported from Sweden to England in 1816, and widely planted in Southern Ontario for a summer market apple. Scarce another apple of its season equals it in beauty of appearance, for, in addition to its rich crimson color, it is often covered with a pale white bloom. Selected fancy grades of this apple are usually in good demand in our home markets, but sometimes there is a surplus, and prices even for Astrachans are very low.



Section of Red Astrachan.



Red Astrachan (Reduced).

Tree, upright ; very vigorous ; begins bearing early ; very productive.

Fruit, medium to large, round, narrowing towards apex ; skin, deep crimson when exposed to sun, yellowish-green in shade, often covered with a thin, whitish bloom ; stem, stout, three-quarter inch long, in a deep, narrow cavity ; calyx closed in a shallow, somewhat irregular basin.

Flesh, white, crisp, juicy, tender, becoming mealy when over-ripe ; acid, almost too tart to be counted first-class for either dessert or cooking ; quality, second class.

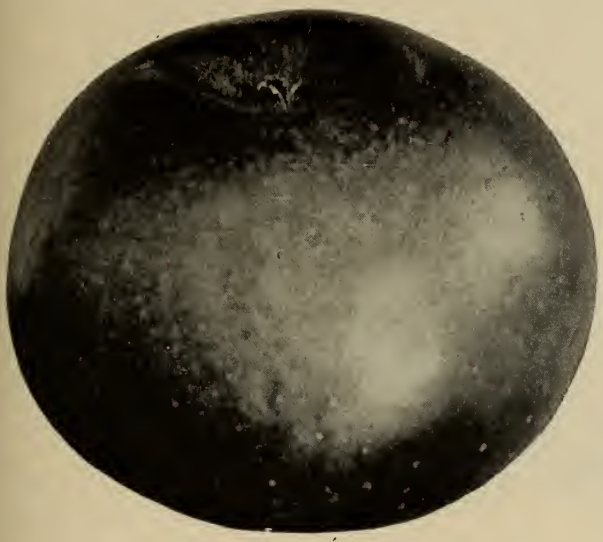
Season, 1st to 20th August.

Adaptation. In Niagara district perfectly hardy and productive. Two trees in 1895 at Maplehurst averaged ten barrels each. Not considered profitable at Simcoe station. Not hardy in northern parts of Ontario county.

Roxbury Russet.

(*Boston Russet.*)

One of the staple export varieties in many parts of southern Ontario, because of its long keeping qualities It resists scab well, but is subject to the codling moth, unless well sprayed, and is inclined to drop early from the trees, resembling the Greening in this respect.



Roxbury Russet.

Origin, Massachusetts.

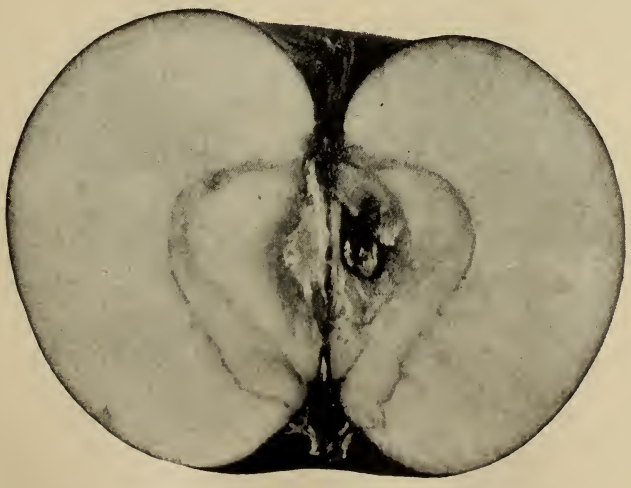
Tree, fairly vigorous, spreading like Greening, but flatter in form of top.

Fruit, medium, roundish oblate, sides not equal; skin tough, green, nearly covered with russet, and having a brownish red cheek when fully exposed to the sun; stem, half to three-quarters of an inch long in a medium sized, regular cavity; calyx closed, in a round medium sized basin.

Flesh, yellowish white, almost coarse grained, moderately juicy; flavor, mild, sub-acid, pleasant.

Season, January to June.

Quality, dessert, fair; cooking; good, home and foreign markets; good.



Section of Roxbury Russet.

Adaptation. Long tested in the Niagara district and found to be well adapted to it. As hardy as the Greening.

Spitzenburgh.

(*Esopus Spitzenburgh.*)

One of the finest dessert apples for late winter use, and widely planted by early settlers throughout southern Ontario. It has proved to be unprofitable as a commercial apple, because the tree is liable to disease, and yields small crops in consequence.

Spitzenburgh.

Origin, Esopus, on the Hudson river.

Tree, lacking in vigor, often showing dead or feeble wood; upright, spreading, with drooping limbs when in bearing; fairly hardy.

Fruit, size, medium to large, oblong, slightly conical; skin, straw color in shade, but usually nearly covered with bright red, and dark red in sun, with a few stripes, and many obscure gray dots; stalk, seven-eighths of an inch long in a narrow deep cavity; calyx, nearly closed, set in a narrow basin of medium depth, slightly corrugated.

Flesh, yellowish white; texture, crisp, juicy, breaking; flavor, brisk, rich, delicious.

Season. December to March.

Quality, first class for all purposes.

Section of Spitzenburgh.

Adaptation. Succeeds well on sandy loam in southern Ontario.

Spy. (*Northern Spy.*)

The Spy stands in the very first rank of Canadian apples, whether for home or foreign markets. Originating in New York State on the line with the southern portion of the Province of Ontario, it succeeds here to perfection. Its beauty of coloring, half shaded by its delicate bloom, and its great excellence of quality for all purposes, justly claim for it its wide popularity. In Chicago, Canadian Spys are more sought for than any other variety, but, owing to tenderness of skin, which shows the slightest bruise, it is less popular for export to Great Britain than some other varieties. The tree is late in coming into bearing, often being fifteen years planted before yielding a crop, and this renders the variety somewhat unpopular with planters. Probably for fancy packages, selected Spys would be among the best.

Spy.

Origin, near Rochester, N.Y.

Tree, Upright and spreading in habit; fruit spurs on interior boughs, very vigorous, late in coming into bearing, but afterwards fairly productive in alternate years; blossoms late in spring and holds its fruit late in the autumn; requires high cultivation and good fertility.

Fruit, large to very large; form, roundish, slightly conical; skin, thin, light green, or pale yellow, sprinkled with light pink, striped and shaded with pinkish red, and thinly covered with thin whitish bloom; stalk, slender, three-quarters of an inch long, in a wide, deep, sometimes russeted cavity; calyx, small, closed, in a narrow, moderately deep, abrupt, irregular basin.

Flesh, white fine-grained, crisp, tender, juicy; flavor, rich, sprightly, subacid, fragrant.

Season, January to May.

Quality, dessert and cooking, first-class: home market, first-class; a little tender for distant shipments.

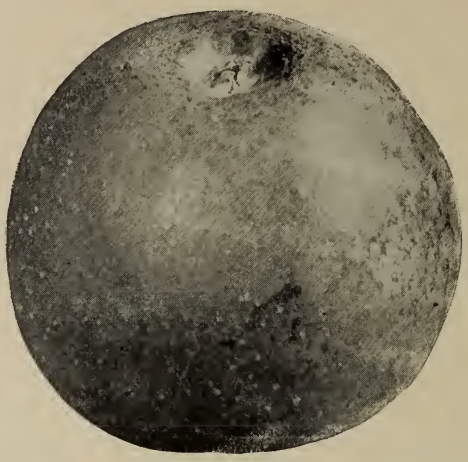
Section of Spy.

Adaptation. Sandy or clay loams in southern and middle Ontario; found tender at Simcoe Experiment Station and at the St. Lawrence Experiment Station.

Swazie Pomme Grise.

(Pomme grise d'or.)

There is no choicer winter dessert apple for the months of December and January than the Swazie Pomme Grise, especially when kept in a cool, dark cellar, as that its crisp texture and excellent flavor may be preserved. Unfortunately, it is not very productive, and, consequently,



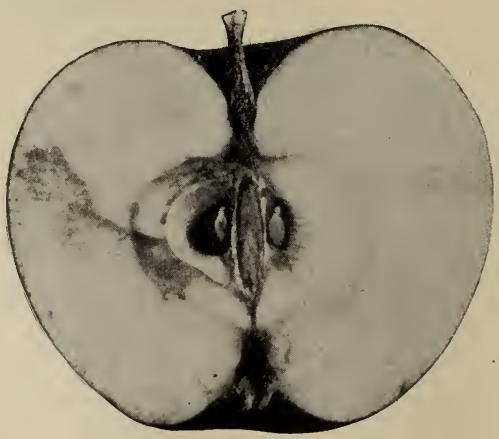
Swazie Pomme Grise.

not profitable. One large tree at Maplehurst, seventy-five years planted, yielded only an average of four barrels each alternate year. It is well worthy of a place in the amateur collection.

Origin, probably with Col. Swazie, near Niagara.

Tree, upright, fairly vigorous and not very productive.

Fruit, small, round, oblate conical; color, deep yellow, well colored with cinnamon russet and many whitish dots; stem, three quarters of an inch long, set in a deep cavity; calyx, closed in a moderately deep, slightly corrugated basin.



Section of Swazie.

Flesh, white, fine grained, tender, crisp, juicy; flavor, aromatic mild sub-acid, pleasant.

Season, December to March.

Quality, dessert, best; cooking, poor; value for home market, poor; value for foreign market poor.

Adaptation. Succeeds in southern Ontario, especially in the Niagara district.

Wealthy.

This beautiful apple was distributed among the members of the Ontario Fruit Growers' Association in 1882 for trial, and has won for itself a good reputation in every part of the Province as a dessert apple of excellent quality, while in the northern portions it is especially desirable on account of its hardiness. Mr. A. A. Wright, of Renfrew, says the tree endures 40° below zero without injury, and he advises planting this variety freely at the north. Mr. R. W. Shepherd, of Montreal, has grown it in that vicinity for years with success for export.

Wealthy.

Origin, St. Paul, Minnesota. By Peter Gideon.

Tree, vigorous, very hardy, over productive.

Fruit, medium, roundish, oblate, regular ; skin, smooth, greenish ground, changing to pale yellow, rich red cheek, with stripes and splashes of red in the sun, sometimes nearly covered with crimson ; stem, one-half to three-quarters of an inch long in a deep, regular cavity; calyx, nearly closed in a deep, abrupt basin.

Section of Wealthy.

Flesh, white, fine grained, tender, juicy, sprightly, pleasant sub-acid.

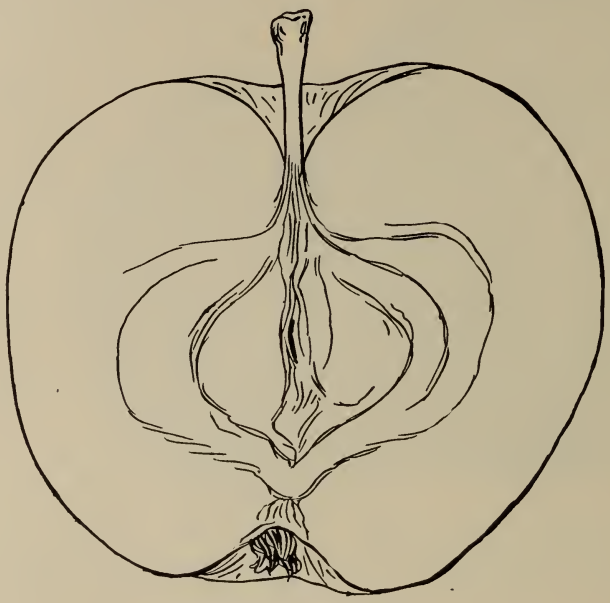
Season, early winter.

Quality, dessert, very good ; cooking, good ; value for home market, very good ; value for foreign market, very good.

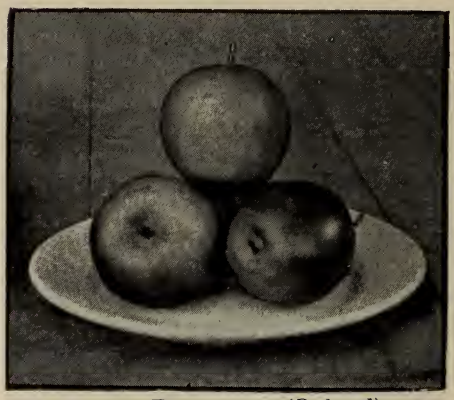
Adaptation. Succeeds at Simcoe, Bay of Quinte, St. Lawrence and Niagara stations, also at Ottawa and Montreal.

Yellow Transparent.

An apple which may prove a substitute for the well-known Early Harvest, which is so subject to apple scab. This variety seems to be proof against fusicladium, both in leaf and fruit.



Yellow Transparent.



Yellow Transparent (Reduced).

Origin, St. Petersburg, Russia. Imported by the U. S. Department of Agriculture in 1870.

Tree, hardy, vigorous, upright, annual bearer, productive, began bearing at four years at Craighurst station.

Fruit, above medium, roundish, oblate, inclined to be conical ; skin, clear white, yellowish white when very mature ; dots, light green, obscure ; stalk, medium, in large cavity ; calyx closed in medium slightly corrugated basin ; fruit hangs well on the tree.

Flesh, white ; firm till very ripe, then tender ; quality, second class.

Adaptation. Tested at Maplehurst, Grimsby ; at Simcoe station, and distributed widely by Ontario Fruit Growers' Association in 1886.

PEARS.

Bartlett.

(In England, Williams' Boncretien.)

No pear of the same season equals in popularity the Bartlett, for either dessert or canning. Indeed, while it is in the market, no other pear compares with it in price or brings as much profit to the grower. Of late large orchards of this one variety have been planted in Canada and the northern States, and immense quantities of this pear are also shipped in car lots from California to our eastern cities, often causing the price to rule very low. In 1896 first-class Bartletts were sold in Toronto during a great part of September at from 30 to 40 cents a basket, and ordinary stock for $2 and $3 a barrel.

Origin, Berkshire, England, 1770, propagated by Mr. Williams, near London. Introduced into America and disseminated by Enoch Bartlett of Boston.

Tree, healthy, vigorous, half-hardy, overcomes blight better than most varieties, very productive.

Fruit, large, oblong, obtuse, pyriform. Color, yellow, with very numerous minute brown dots, often russetted at the apex. Stem, $1\frac{1}{4}$ inches long, in a small irregular cavity. Calyx, open in an irregular basin.

Flesh, creamy white, fine grained, very buttery and juicy; flavor, sweet, perfumed, vinous.

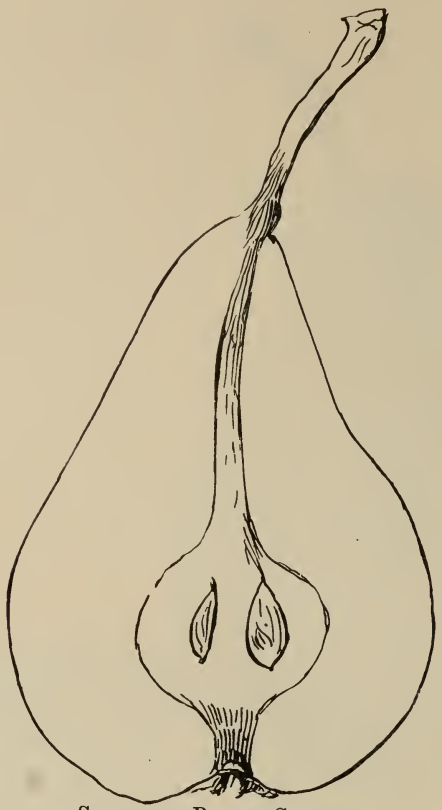
Season, September.

Quality, dessert, very good, market, best.

Adaptation, succeeds admirably in southern Ontario, and as far north as our Bay of Quinte station.

Beurre Giffard.

An excellent early summer pear, of large size and good quality. Probably none of its season is more desirable both for home use and market.



Section of Beurre Giffard.

Giffard (reduced).

Origin, chance seedling with M. Giffard, Angers, France

Tree, moderately vigorous, healthy and productive.

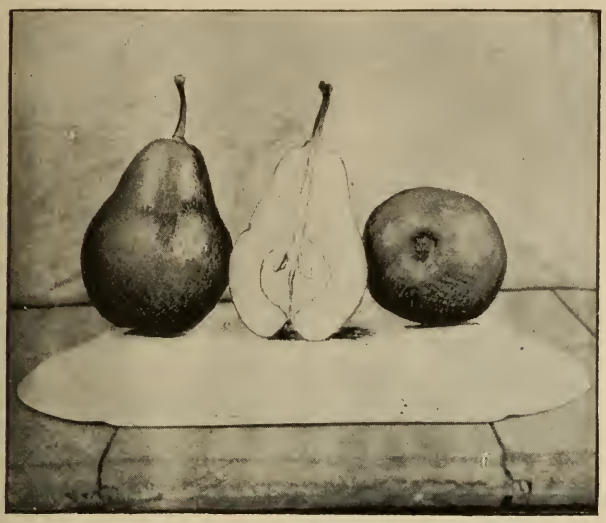
Fruit, medium, acute pyriform ; skin, greenish-yellow, shaded with red in the sun ; calyx closed in a very shallow basin.

Flesh, white, melting, agreeable aromatic flavor.

Season, August.

Tested on top graft four years at Maplehurst, Grimsby ; also at the Wentworth Experiment Station.

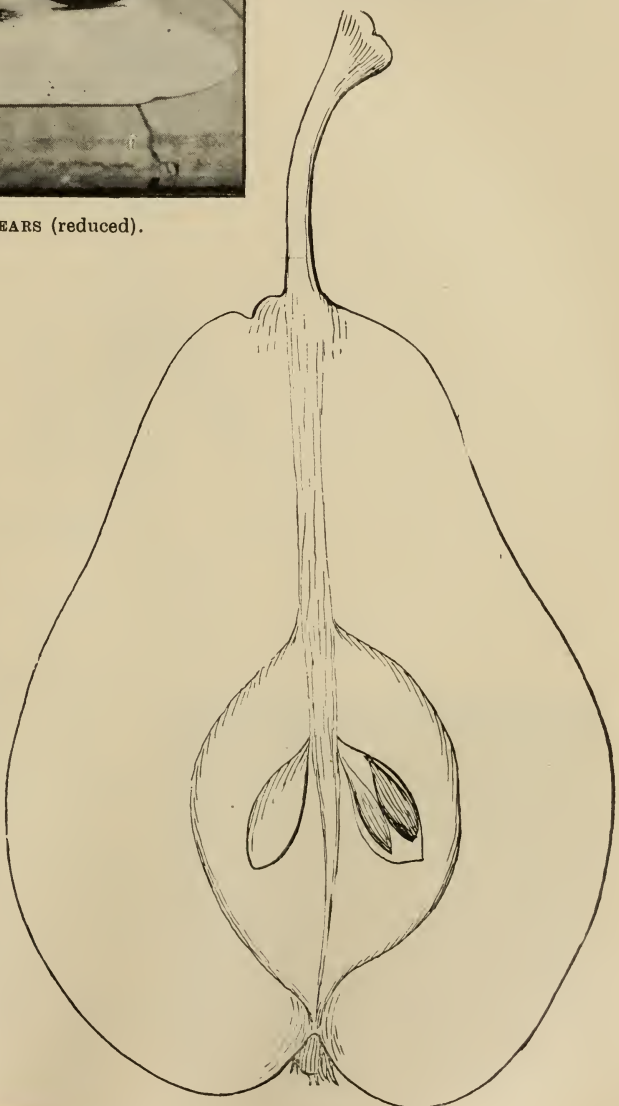
Dempsey.



A Plate of Dempsey Pears (reduced).

The Dempsey was originated near Trenton in Prince Edward County, by Mr. P. C. Dempsey, the late well-known Director of our Association for that district. It was produced from a seed of a Bartlett, fertilized with Duchess d'Angouleme. The tree is a good grower and quite productive. The fruit is firm and consequently would ship well.

Description: Fruit large, oblong, obovate, pyriform; skin smooth, yellowish-green, with brownish-red cheek in sun; stem about one inch long, set in a fleshy base, and with almost no cavity; calyx nearly closed in a moderately deep uneven basin, core small. Flesh white, fine grained, tender, almost melting, with sweet delicious flower Season, last of October, November.

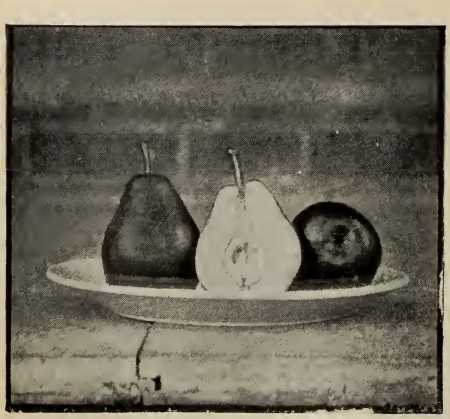


Section of Dempsey Pear.

Buffum.

A reliable kind for health of tree and productiveness, but its season follows the Bartlett too closely to be of any great value in the market. Besides, there are other varieties of about the same season which are more desirable for both table and market, for the fruit is often below medium size and of only fair quality.

Section of Buffum.



Buffum (Reduced).

Origin, Rhode Island.

Tree, very upright, vigorous, productive, not subject to blight.

Fruit, medium, oblong, obovate, slightly one-sided ; skin, yellowish, with a brownish-red cheek, with small brown dots ; stalk, one inch long, in a very small cavity ; calyx closed in a small regular basin.

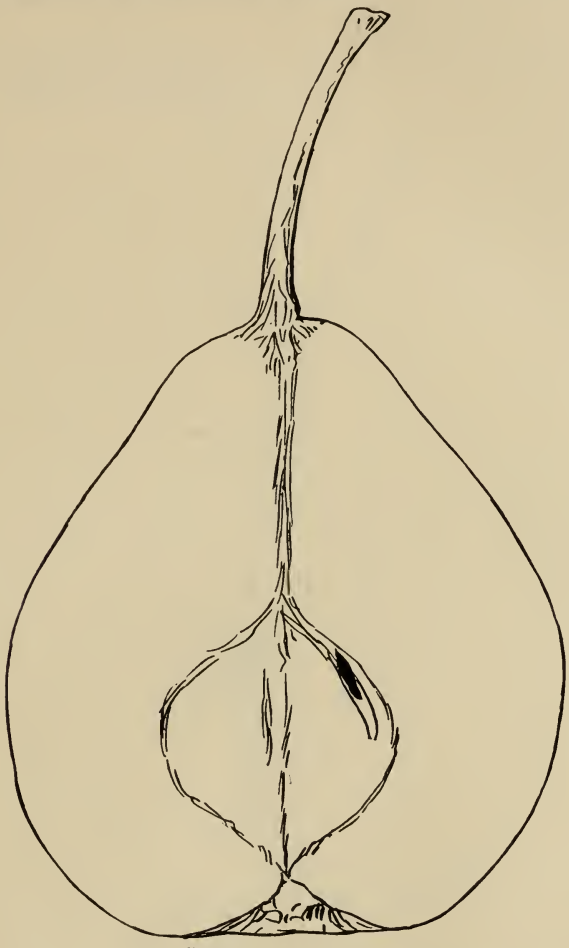
Flesh, white, buttery, moderately juicy slightly granular, of agreeable aromatic flavor.

Season, September 20th to October 1st.

Tested at Maplehurst thirty years.

Howell.

One of the best market pears of its season for Southern Ontario, especially where grown on a standard. Its vigor of tree, regularity of bearing, clear skin, and good size and quality make it a desirable variety for the commercial orchard.



Section of Howell.

Origin, New Haven, Conn. Named after the originator, Thomas Howell.

Tree, upright, healthy and vigorous, an early bearer, productive.

Fruit, large, obovate pyriform ; skin, yellowish green, waxen, reddish dots on sunny side, russet dots in shade ; stem one and three-quarter inches long ; no cavity, sometimes lipped ; calyx partly open in a deep russeted basin ; core small ; seeds few, small.

Flesh, creamy white, juicy, melting, granular near the core ; flavor agreeable vinous ; a little tart.

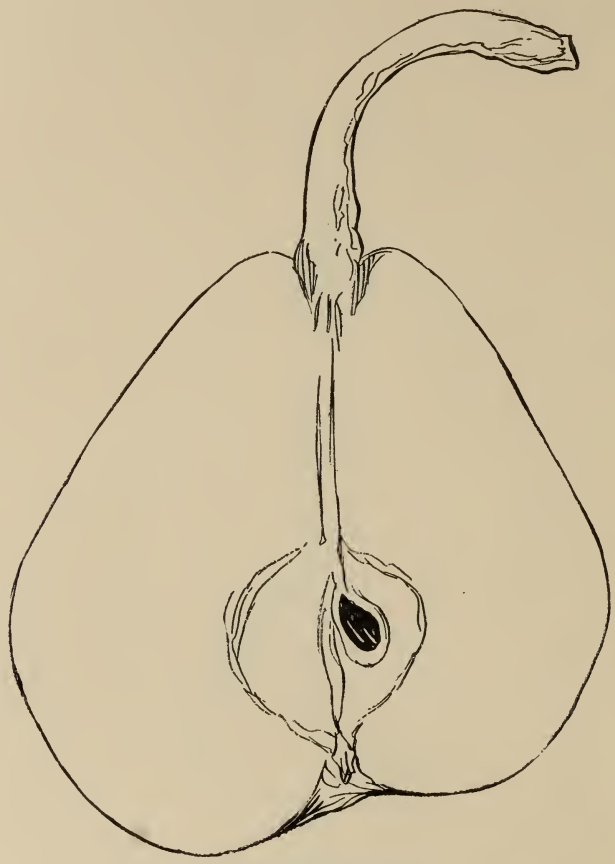
Season, middle September to middle of October.

Tested twenty-five years at Maplehurst, Grimsby.

Howell (Reduced).

King Sessing.

A worthless variety for either home use or market, because it always decays at the core, while still apparently sound.



Section of King Sessing.

King Sessing (Reduced).

Origin, near Philadelphia.

Tree, fairly vigorous, of sprawling habit.

Fruit, large, obovate, obtuse pyriform ; skin, greenish-yellow, with minute greenish dots ; stem, two inches long, curved, fleshy at its insertion in a small uneven cavity ; calyx small, closed in a deep irregular basin ; core small, inclined to rot.

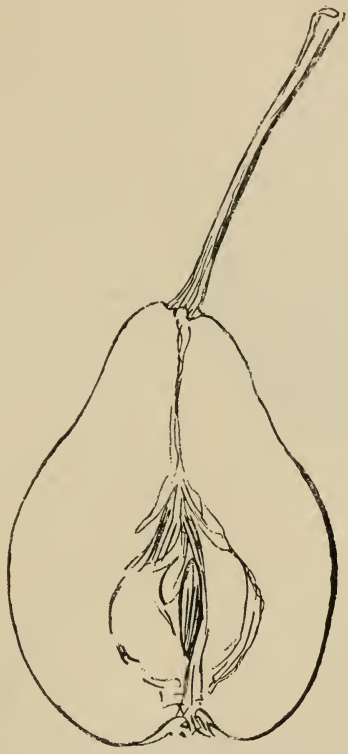
Flesh, whitish, juicy, melting and of good flavor.

Season, September 20th to October 1st.

Tested thirty years at Maplehurst.

Rostiezer.

A small unattractive looking pear, of very high quality. It is the best of its season in quality for dessert purposes, and should have a place in the home garden. What the Seckel is in October, this pear is in August. Packed in small packages and labelled "extra quality dessert pears," the writer was able to sell them at a fancy price, but usually the pear sells far below its value on account of its ordinary appearance.



Section of Rostiezer.

Origin, Foreign.

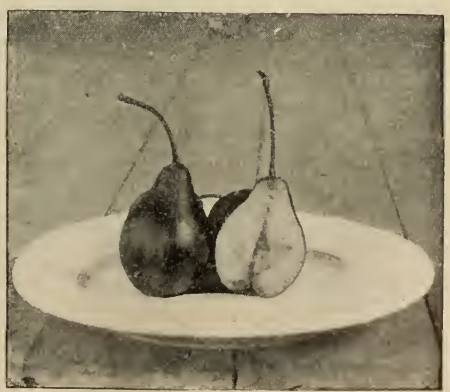
Tree, healthy, vigorous, sprawling habits, shoots few, and need shortening in.

Fruit, small to medium, obovate, oblong pyriform ; skin, green, sometimes turning yellowish, with reddish-brown cheek ; stem slender and nearly two inches in length ; calyx open ; basin small.

Flesh, juicy, melting, sweet, very delicious, of very finest quality.

Season, middle to end of August.

Tested twenty years at Maplehurst.



Rostiezer (Reduced.

Sapieganka

Sapieganka.

A Russian pear of fine appearance, scions of which were sent out to the Secretary of the Ontario Fruit Growers' Association in 1892 by Mr. Jaroslav Niemetz, of Winnitza, Podolie, Russia. It fruited at Grimsby in 1895 and 1896, ripening about August 12th to 20th. Its fine appearance is in its favour, but its quality is inferior to other varieties of its season, and, unless it should prove desirable on account of its hardiness, would not be worthy of general cultivation. Mr. Niemetz says, "In its home in Lithuania, old and large trees are met with which have endured many and severe winters In the Tamboff Government, it is the most hardy of all pears there grown, and, therefore, is certainly a hardy variety. The flavor of the fresh depends upon local conditions, for, though it is tasteful enough in the warmer districts, it is sometimes harsh ; when grown in the north is juicy and buttery." Unfortunately the tree is subject to blight.

Tree, hardy, productive but subject to blight.

Fruit, medium size, oblate, often somewhat flattened ; color, brownish yellow, with brownish red in sun, with numerous small dots ; stem, long in small cavity ; calyx, segments large, partly open in a broad, wrinkled base.

Fresh, white, texture coarse, somewhat firm and juicy ; flavor, sweet and agreeable.

Season. August 12th to 20th.

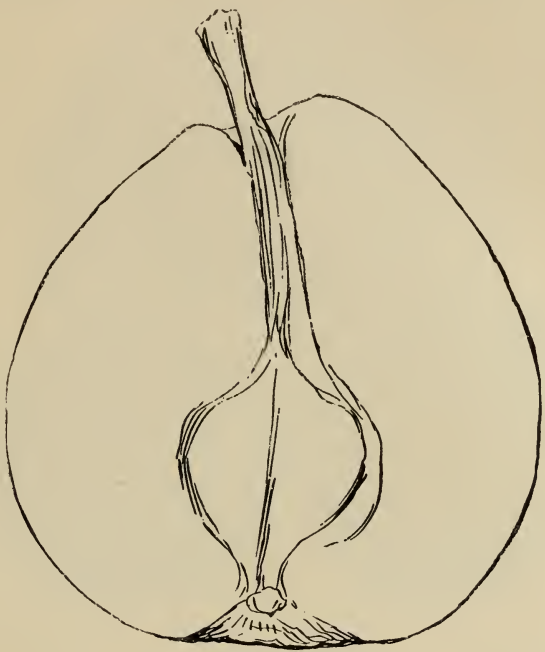
Quality, dessert, poor ; cooking, poor, home market, fairly good ; distant market, poor.

Adaptation. Succeeds well at Grimsby. Tested by the Dominion Experimental Farm system and found tender in Manitoba and the Northwest, but perfectly hardy at Ottawa and in Muskoka.

Section of Sapieganka.

Sheldon.

One of the most delicious of dessert pears, if eaten just at the proper time. Worthy of a place in every home garden, but not productive enough to be planted for market.



Section of Sheldon.

Origin, accidental on farm of Norman Sheldon of Huron, Wayne Co., N.Y.
Tree, vigorous, erect, not very productive, late coming into bearing.

Sheldon.

Fruit, above medium in size, roundish, obtuse obovate ; skin, yellowish-green, covered with thin light russett, brownish crimson in sun, russet dots ; stalk, short, stout, in a narrow cavity ; calyx nearly open, in a broad basin.
Flesh, creamy, buttery, juicy, sweet, aromatic.
Season, October.
Tested twenty years at Maplehurst.

PEACHES.

Alexander.

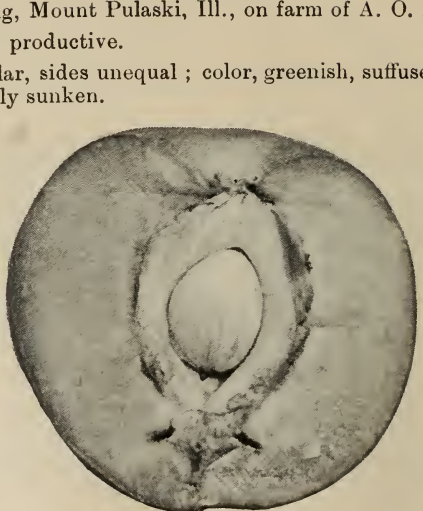
The earliest peach grown in the Niagara district and in Essex county. It is a clingstone, of poor quality for dessert purposes, and poor also for cooking, so that, in competition with yellow-fleshed Elbertas and Crawfords from southern peach orchards, it sells at a low price in our markets.

Alexander (reduced)

Origin, chance seedling, Mount Pulaski, Ill., on farm of A. O. Alexander.

Tree, vigorous, hardy, productive.

Fruit, medium, globular, sides unequal ; color, greenish, suffused with dark and light red ; suture, broad ; apex, slightly sunken.



Section of Alexander.

Flesh, greenish white, firm, juicy, half melting, clings to stone ; flavor, sweet and fairly good.

Season, July 20 to 30.

Quality, dessert, poor ; cooking, poor ; home market, poor ; distant market, very poor.

Adaptation. Succeeds at Niagara and Southwestern stations.

Crawford's Early.

Crawford's Early has long held its place at the head of the list of peaches both for home use and for market. Its beautiful golden color, its large size, its free stone and rich flavor all

Crawford's Early

unite in giving it a just claim to this position. Its buds are a little more tender than those of some other varieties, and, consequently, many growers hesitate to plant it, but where high cultivation and plenty of fertilizer is given, fine crops of luscious fruit have resulted.

Origin, Middleton, N.J., by Wm. Crawford.
Tree, vigorous, productive under favorable conditions.

Section Crawford's Early

Fruit, large to very large, oblong ; suture, shallow ; apex, prominent, swollen ; color golden-yellow, with rich red cheek.
Flesh ; yellow, sweet, rich, free from stone which often parts in middle when nearly ripe.
Season, last of August.
Quality ; dessert and cooking, very good ; market value, best.
Adaptation. Niagara district and parts of Essex county.

GRAPES.

Concord.

The principal out-door grape grown for mark t in the province of Ontario. Probably more than half the vines in the large commercial vineyards of the Niagara district, as well as in Essex and other parts of southern Ontario, are of this variety.

The reason of this is (1) its comparative freedom from mildew, (2) its vigor of vine, (3) its productiveness. Four tons to the acre is not an uncommon yield, so that, even if it sells as low as 1½ cents per pound, there is yet a fair return for the investment. Still it is an open question whether in the near future it will not pay the grower better to plant varieties of higher quality that will bring a higher price, though they may be less productive.

Origin, Concord, Mass., by E. W. Bull. First exhibited by him in 1853.

Concord.

Vine, hardy, healthy, strong, vigorous grower, very productive, resists both insects and fungi well.

Bunch, large, shouldered, fairly compact, five to six inches in length.

Berry, large, round, black, covered with heavy blue bloom ; skin, medium thickness, tender, sometimes cracks open ; flesh, pulpy, tender, moderately juicy ; flavor, sweet when fully mature, appetizing.

Season, middle of September and October ; not a good keeper.

Quality, dessert, fair ; near market, good ; distant market, poor.

Adaptation. Tested at Wentworth, Niagara, Southwestern and Bay of Quinte stations, in all of which it ripens well in the open air.

Delaware.

Universally acknowledged to stand at the head of all American grapes in point of quality. For the home garden a few vines of this variety are indispensable, for it is the most excellent of dessert varieties. It is also one of the highest priced grapes in our markets, often bringing more than double the price of the Concord. It is, however, not very much grown in our commercial vineyards, because the foliage is badly subject to thrip and the yield is only moderate. On rich deep soils, well drained, however, with high cultivation, thinning and close pruning, it is productive and profitable. It should be planted much closer than the Concord. Vines of the latter variety are usually planted ten feet apart, while the Delaware may be set five or six feet apart.

Delaware.

Origin, unknown. Name from Delaware, Ohio, where in 1855 it was first brought into notice, though not disseminated until ten years later. It was first found in a garden in Frenchtown, N.J. The Bushberg Catalogue thinks it a natural cross between Labrusca and Vinifera, a native American and a European variety.

Vine, moderate grower, foliage delicate, subject to thrip; wood slender, hardy, regular, sometimes an abundant bearer.

Bunch, small, compact, usually shouldered.

Berry, small, round; skin, thin, beautiful light red, with whitish bloom, translucent; pulp sweet, sprightly, aromatic; juice abundant, sweet, vinous.

Season, September.

Value, dessert, best; market, best.

Adaptation. Succeeds at the Niagara, Wentworth, and Bay of Quinte stations, and throughout the southern and middle portions of the province generally.

CHERRIES

Black Tartarian.

Of all our black cherries, this is one of the choicest, whether for market or for dessert on the home table. Of large size and delicious flavor, it is relished by all cherry lovers, and, being somewhat soft fleshed, it is very subject to the ravages of birds. On this account it is often necessary to harvest and ship it a little on the green side. It is not so productive as some others, but it makes this up by bringing a higher price. Origin, Russia and Western Asia, introduced into England in 1796 and thence to America.

Black Tartarian.

Tree, erect, vigorous, attaining large size, fairly productive.

Fruit, very large, heart shaped, of somewhat irregular outline ; stem, $1\frac{3}{4}$ inches long ; skin, bright purplish black.

Flesh, dark purple, tender and juicy ; flavor, rich and delicious.

Season, June 22nd to 30th.

Adaption. South of Lake Ontario, and in sheltered places a little further north.

Early Purple.

(Early Purple Guigne).

The earliest cherry is the Early Purple, a foreign variety known in France as the Early Purple Guigne. The tree is a vigorous, upright grower, and becomes quite productive as the tree acquires age. A tree at Grimsby, about thirty years planted, yielded in 1896, 144 quarts. They were harvested on the 11th of June, and sold in the wholesale market at an average of twelve cents per quart. This is the tree's best record, for usually the birds destroy the fruit before it matures, and if gathered as soon as colored red, it is little more than "skin and bones." The last few days of growth it fills out wonderfully, and becomes almost a so-called "black cherry." The branch which we photographed was taken from the tree above referred to and shows the habit of fruiting.

Early Purple.

Tree, upright, vigorous, healthy, productive when full grown.

Fruit, medium size, roundish heart-shaped ; skin dark red to purple ; stem two inches long in a shallow cavity ; suture obscure.

Flesh, red to purple ; texture tender, juicy ; flavor sweet and pleasant.

Season, June 10th to 15th in 1896, south of Lake Ontario.

Quality, dessert, good ; market, good.

Adaptation. Grown at Grimsby for thirty years and quite hardy fairly hardy in Maine and Michigan ; recommended for trial north of Lake Ontario.

Governor Wood.

This variety has been grown on the grounds of the secretary, Mr. L. Woolverton, at Grimsby, for thirty years (1865-1895) and has proved itself the most satisfactory cherry of its season for both dessert and market purposes. It is a very productive variety, often averaging 100 quarts to a tree, and, though somewhat tender in flesh, is not nearly so subject to ravages by birds as Early Purple or Black Tartarian. Originated by Prof. Kirtland of Cleveland, Ohio, U. S. A.

Governor Wood.

Tree, upright, spreading, healthy, vigorous and hardy wherever the peach succeeds.

Fruit, medium to large, roundish-heartshaped ; skin, light yellow, shaded with light to deep red ; stem 1½ inches long in a broad deep cavity ; suture, distinct on one side.

Flesh, yellowish, tender, juicy, sweet, aromatic and delicious.

Season, June 16th to 25. (June 12th to 15th in 1896).

Quality, dessert, very good ; cooking, good ; home market, very good ; distant market good.

Adaptation. Wherever the peach succeeds.

Napoleon.

(*Napoleon Bigarreau, Royal Anne of California.*)

A valuable variety of foreign origin. Perhaps the most productive variety known, yielding fruit of the very largest size which is in good demand and, therefore, one of the most desirable varieties for the commercial orchard. It has one serious fault, namely, it is very subject to the rot, especially in wet seasons, and sometimes the whole crop of this variety is ruined by it.

Napoleon.

Tree, upright, spreading, vigorous, hardy on the south shore of Lake Ontario. Very productive.

Fruit, very large, oblong heart shaped; skin, yellow ground, light in shade, rich red cheek in the sun, sometimes mottled; stem, $1\frac{1}{8}$ inches long; suture plainly traceable.

Flesh, yellowish white, very firm, meaty, fairly juicy, good flavor, much esteemed for canning because it looks well in the jars and bears cooking well.

Season, July 1 to 6.

Quality, dessert medium; market, very good to best.

Adaptation, the southern part of the Province of Ontario.

Rockport.

A Bigarreau originated by Prof. Kirtland, of Cleveland, Ohio. Its season of ripening is about the same as Governor Wood, but it is a heavier bearer of fruit, about the same size and less highly colored. It would be profitable were it not so subject to rot, but nearly every year we have lost a large portion of the crop of this variety at Maplehurst from this cause. In the season of 1896 there was no rot, and a tree of this variety yielded about 100 quarts. Like the other bigarreaus, it is too firm a cherry to be a favorite with the birds.

Rockport.

Tree, upright, spreading, fairly vigorous and very productive.

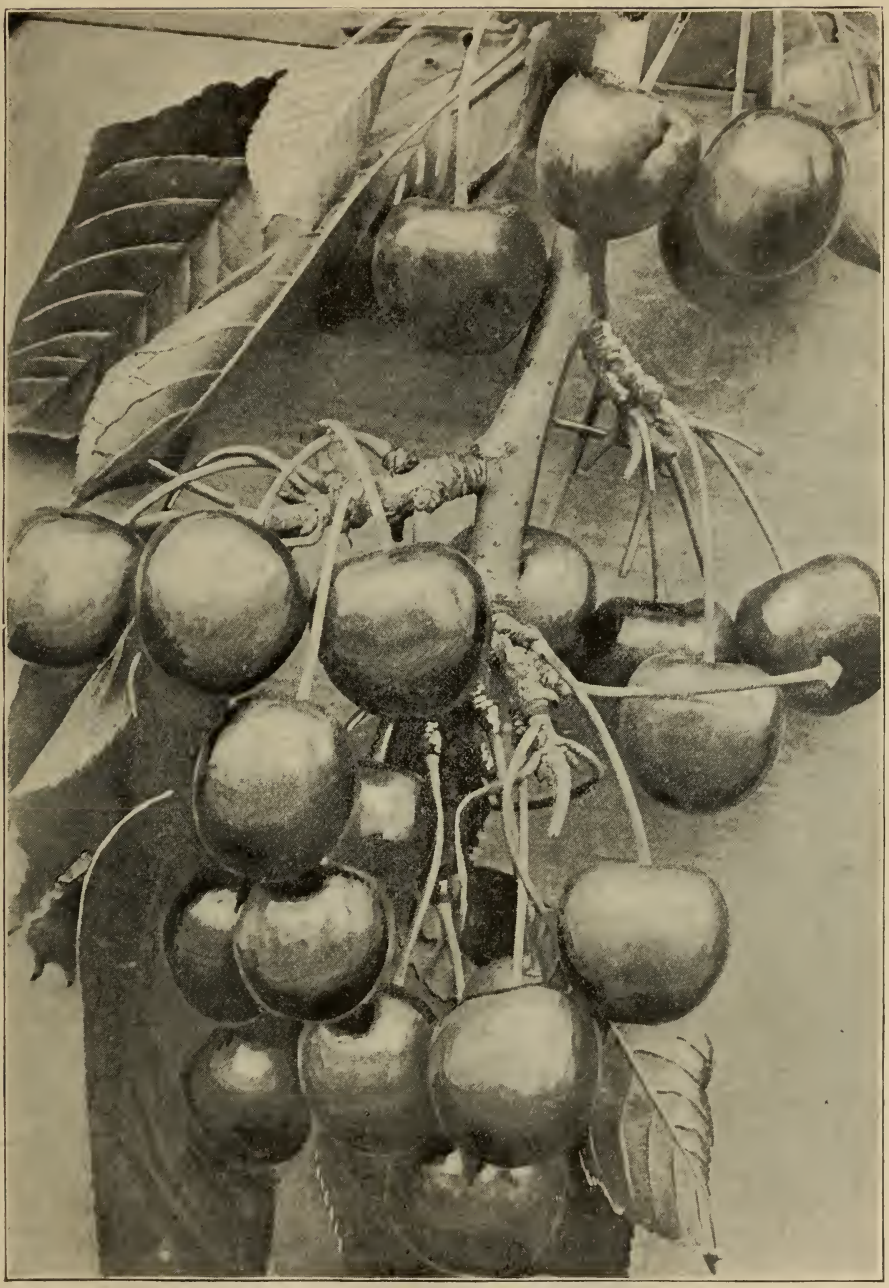
Fruit, large, roundish, obtuse heart-shaped; skin, amber, nearly covered with bright red.

Flesh, pale yellow; texture, firm, juicy, flavor, sweet and good.

Quality, dessert or cooking, medium. Home market, medium.

Season; June 17 to 30.

Adaptation. Southern Ontario.



YELLOW SPANISH—FRUITING BRANCH IN 1896.

Yellow Spanish.

Of all the Bigarreau cherries this is one of the finest, both on account of its great size and its delicious flavor. The tree grows to a very large size, surpassing in this respect any other cultivated variety with which we are acquainted. It does not average very productive, because the fruit often blasts and drops, or is destroyed by Monilia. When, however, it does mature a good crop, as in 1896, the yield is wonderful; indeed in 1896 one tree at Maplehurst yielded 360 quarts of beautiful fruits! This of course was an exceptional yield. (See engraving of fruiting branch.

The variety is of European origin, and was introduced into the United States in 1800.

Yellow Spanish.

Tree, very vigorous, of large growth, spreading, very productive.

Fruit, very large and of a beautiful waxy lustre; form, round, obtuse, heart-shaped; skin, clear amber, nearly covered with red when exposed to the sun; stem, stout, 1½ inches long in a wide cavity; suture, traceable.

Flesh, pale yellow; texture firm, juicy, breaking; flavor, sweet, delicious when well ripened.

Season, June 25 to 30 in 1896.

Quality, dessert very good; market very good to best.

Adaptation. Succeeds in peach sections, on well drained sandy soil.

STRAWBERRIES.

Clyde.

(*Perfect blossom.*)

Originated in Kansas, from seed of the Cyclone, about 1890, by Dr. Stayner, the Cyclone being produced from Crescent crossed with Cumberland. Thus we find out where the Clyde gets its great hardiness and productiveness, viz., from the Crescent. The first berries are as large as the Bubach and very productive. It grows very much like its parent Cyclone, also like the Haverland, but more vigorous than either. It has secured for itself very quickly a place among the standards, if it does not stand first, which place many are claiming for it.

Plant, a strong and vigorous grower. Perfect in every respect. No rust or trace of disease. Its fruit stalk is just the right length and strong enough to hold up the great load of fruit. In color, light, like Haverland. Strong, and has many runners that take root easily.

Fruit, very large, as large as Bubach, roundly conical, bright dark scarlet in color, and very firm.

Flesh, pinkish white, fine eating, very pleasant to the taste, quality first-class.

Season, second early.

Adaptation. Does well everywhere and in all soils. (E. B. S.)

Clyde (Engraved from photograph.)

Haverland.

(Imperfect blossom.)

Originated in Ohio by Mr. Haverland. Parentage unknown. Wi lely planted, and is one of the most productive. It's only fault is that in a wet season the fruit is somewhat soft. On the whole it is one of the best.

Plant, very healthy. Vigorous grower, sending out strong runners. Its foliage is magnificent. Fruit stalk is very long and often not able to bear up the immense load of fruit the plant matures. Light in color of leaf.

Fruit, large to very large, long, bright scarlet, medium in firmness.

Flesh, pinkish, sweet and good quality.

Season, it is one of the first to ripen and continues all through the season.

Adaptation. It succeeds well everywhere and all soils suit it. (E. B. S.)

Haverland (Engraved from photograph.)

MEETINGS OF THE BOARD OF CONTROL IN 1896.

The Board of Control met in the Railway Committee room of the House of Parliament, on the 28th of January, at eleven o'clock. There were present Dr. Mills, Chairman; H. L. Hutt, Horticulturist; L. Woolverton, Secretary, and Messrs. Wellington, Smith and Pettit.

Lists of fruits were presented by the Secretary and revised by the Board. Ordered, that these lists be further enlarged and the stock ordered for the various stations.

Ordered that the following list of stations be recommended to the Department for the year 1896, with specialties as set down opposite the title of each, viz. :

No.	Name.	Location.	Specialty.	Experimenter.
1.	Southwestern Station,	Leamington, Essex county	Peaches	W. W. Hilborn.
2.	Niagara,	near St. Catharines, Lincoln county	Tender fruits	M. Burrell.
3.	Wentworth,	near Winona, Wentworth county	Grapes	M. Pettit, Winona.
4.	Burlington,	near Burlington, Halton county	Blackberries, currants and commercial pears	A. W. Peart, Freeman.
5.	Lake Huron,	Walkerton, Bruce Co	Commercial apples and raspberries	A. E. Sherrington.
6.	Georgian Bay,	near Clarksburg	Plums	John Mitchell.
7.	Simcoe,	Craighurst, Simcoe county	Hardy apples and hardy cherries	G. C. Caston.
8.	East Central,	Whitby, Ontario Co	Pears and commercial apples	R. L. Huggard.
9.	Bay of Quinte,	near Trenton, Northumberland county	Apples	W. H. Dempsey, Trenton.
10.	St. Lawrence,	near Prescott, Grenville county	Hardy pears and plums	Harold Jones, Maitland.

Sub-stations.

11.	Strawberry Station, Guelph	E. B. Stevenson, Freeman.
12.	Gooseberry Station, Nantye, Simcoe county	Stanley Spillett.

Ordered, that the following appointments be settled upon by this Board: A. E. Sherrington, Walkerton, commercial apples and raspberries; R. L. Huggard, Whitby, pears and commercial apples; Harold Jones, Maitland, hardy pears and plums.

Ordered, that the Secretary write delinquent experimenters notifying them that any extra allowance at any time will be wholly dependent upon the amount of special records made of experimental work, and that the maximum allowance is conditioned upon such station being kept to the satisfaction of the executive.

The estimates for 1896 were considered and the sum of $2,605 approved of by the Board as the probable expenditure in 1896.

Ordered, that the Secretary explain to each experimenter that any books or nozzles furnished them for use, are to be considered the property of this Board.

Ordered, that the Secretary confer with the Minister regarding the bottles necessary for preserving fruits for the Industrial.

Ordered, that the Secretary be authorized to engage assistants at the Industrial, at the rate of $2 per day.

Ordered, that the Secretary and Mr. Hutt prepare a circular for each experimenter, calling attention to the importance of keeping careful records of experimental work for the report.

The annual meeting of the Board of Control for 1896 was held at Ontario Agricultural College, Guelph, on Monday evening, the 16th November, at 7.30 p.m.

The Secretary read the minutes of the previous meeting, which were approved. He also reported that in carrying out the instructions of the Board, he had ordered for the Stations the following varieties of fruits, together with some duplicates of varieties previously sent. The reason for sending duplicates was in some cases to make sure of the identity of varieties by securing them from different sources, and in others to make up for varieties which had died out, or to have the varieties tested as trees which were first tested only as scions.

VARIETIES ADDED TO THE STATIONS IN 1896.

No. 1—SOUTH-WESTERN STATION.

Peaches.—45 Varieties.

Adrian.
Ameliaberta.
Beer's Late.
Beer's Smock.
Bokara.
Bokara No. 3.
Conkling.
Early Silver.
Emperor.
Ford Early.
Freehold.
Gibson's Late.
Gold Dust.
Good.
Goshawk.
Great Northern.
Haine's Early.
Hance's Golden.
Heath Cling.
Hyslop.
Kenrick's Heath.
Key Port White.
Levy's Late.
Lovett's White.
Magdala.
Mary's Choice.
Miller's Cling.
Mountain Rareripe.
Mrs. Brett.
Northern Apricot.
Orange Free.
Princess of Wales.
Red River.
Reed's Early Golden.
Shangai.
Surpass Melocoton.
Sneed.
Steadley.
Summer Snow.
Thurber.
Triumph.
Ward's Late.
Washington.
Yellow St. John.
Yeushi Hardy.

No. 2.—NIAGARA STATION.

Peaches.—45 Varieties.

Barnard.
Bokara No. 3.
Champion.
Conkling.
Crawford Late.
Crosby.
Early Canada.
Early Richmond.
Early York.
Elberta.
Fitzgerald.
Foster.
Garfield.
Globe.
Golden Drop.
Hales.
Hill's Chili.
Honest John.
Hortense Rivers.
Hyne's Surprise.
Jacques Rareripe.
Large Early York.
Lord Palmerston.
May's Choice.
Morris White.
Old Mixon Cling.
Old Mixon Free.
Ostrander's Late.
Red Cheek Melocoton.
Salway.
Schumaker.
Smock.
Steadley.
Steven's Rareripe.
Stump the World.
Susquehana.
Thurber.
Troth's Early.
Tyhurst.
Wager.
Waterloo.
Wheatland.
Wonderful.
Yellow Rareripe.
Yellow St. John.

Apricots.—10 Varieties.

Alberge de Montgamet.
Blenheim.
Breda.
Early Golden.
Early Moorpark.
Large Early Montgamet.
Luizet.
Montgamet.
Moorpark.
Peach.

Cherries.—14 Varieties.

Black Tartarian.
Downer's Late.
Dyehouse.
Early Richmond.
Early Purple.
Governor Wood.
Late Duke.
Mercer.
Montmorency.
Montmorency Ordinaire.
Napoleon.
Reine Hortense.
Royal Duke.
Windsor.

MULBERRIES.—3 VARIETIES.

Downing.	New American.	Hick's Everbearing.

NECTARINES.—3 VARIETIES.

Boston.	Downton.	Early Violet.

NUTS (CHESTNUTS).—9 VARIETIES.

Alpha.	Giant.	Parry's Superb.
Beta.	Kentish Cob.	Ridgely.
Early Reliance.	Paragon.	Spanish.

PLUMS.—15 VARIETIES.

Abundance.	Hudson River Purple Egg.	Prince of Wales.
Burbank.	Japan.	Satsuma.
Czar.	Ogon.	Saunders.
Peter's Yellow Gage.	Grand Duke.	Spaulding.
Gueii.	Pond's Seedling.	Willard.

No. 3.—WENTWORTH STATION.

GRAPES.—14 VARIETIES.

Alice.	Cunningham.	Herbemont.
Beauty.	Excelsior.	Herman Jaegar.
Black Hawke	Faith.	Mason Seedling.
Black July.	Grein's No. 7.	Poughkeepsie Red.
Brilliant.	Hayes.	

CHERRIES.—1 VARIETY.

Mercer.

PLUMS.—1 VARIETY.

Monarch

No. 4.—BURLINGTON STATION.

BLACKBERRIES.—11 VARIETIES.

Bangor.	Eldorado.	Stone's Early.
Child's Tree.	Humboldt.	Wilson Junior.
Dorchester.	Logan.	Wilson's Early.
Early King.	Maxwell.	

CURRANTS.—11 VARIETIES.

Belle de St. Giles.	North Star.	Victoria.
Black Victoria.	Red Cross.	White Grape.
Fays.	Raby Castle (Victoria).	White Imperial.
Lee's Prolific.	Versailles.	

GRAPES.—12 VARIETIES.

Agawam.	Green Mountain.	Northern Light.
Barry.	Lady.	Pocklington.
Brilliant.	Lindley.	Salem.
Catawba.	Massasoit.	Wilder.

NUTS.—1 VARIETY.

Giant chestnut.

PEARS.—19 VARIETIES.

Beurre d'Anjou.	Idaho.	Souvenir du Congres.
Beurre Bosc.	Josephine de Malines.	Sudduth.
Clairgeau.	Kieffer.	Summer Doyenne.
Clapp's Favorite.	Lawrence.	Vermont Beauty.
Doyenne Boussock.	Lawson.	Wilder.
Giffard.	Margaret.	Winter Nelis.
Howell.		

PLUMS.—18 VARIETIES.

Abundance.
Burbank.
Czar.
Fellemberg.
Grand Duke.
Gueii.
Hudson River Purple Egg.
Lincoln.
Moore's Arctic.
Peter's Yellow Gage.
Pond Seedling.
Prince of Wales.
Satsuma.
Saunders.
Shropshire Damson.
Spaulding.
Weaver.
Willard.

RASPBERRIES.—11 VARIETIES.

Columbian.
Gregg.
Japanese Wineberry.
Johnson Sweet.
Kansas.
Louden.
Lovett.
Ohio.
Onondaga.
Redfield.
Souhegan.

No. 5.—LAKE HURON STATION.

APPLES.—9 VARIETIES.

Alexander.
Blenheim.
Chenango.
Oldenburg.
Pewaukee.
Red Astracan.
Sutton Beauty.
Yellow Transparent.
Wealthy.

BLACKBERRIES.—3 VARIETIES.

Ancient Briton.
Child's Tree.
Stone's Hardy.

PLUMS.—1 VARIETY.

Field.

RASPBERRIES.—41 VARIETIES.

All Summer.
Brandywine.
Brinckle's Orange.
Caroline.
Columbian.
Cuthbert.
Gault.
Gladstone.
Golden Queen.
Gregg.
Hansell.
Hilborn.
Japanese Golden Mayberry.
Japanese Wineberry.
Johnston Sweet.
Kansas.
Lottie.
Louden.
Lovett.
Mammoth Cluster.
Marlboro'.
Maxwell.
Miller.
Ohio.
Ohmer.
Palmer.
Phœnix.
Progress.
Rancocas.
Redfield.
Reliance.
Royal Church.
Shaffer.
Smith's Giant.
Souhegan.
Strawberry Raspberry.
Superlative.
Thompson's Early.
Turner.
Tyler.
White Champlain.

No. 6.—GEORGIAN BAY STATION.

APPLES.—7 VARIETIES.

Blenheim.
Chenango Strawberry.
Cranberry Pippin.
LaRue.
McIntosh Red.
Ontario.
Sutton Beauty.

CHERRIES.—2 VARIETIES.

Montmorency Ordinaire.
Windsor.

PEACHES.—4 VARIETIES.

Crawford.
Crosby.
Smock.
Yellow St. John.

PEARS.—2 VARIETIES.

Dempsey.
Ritson.

GOOSEBERRIES.—4 VARIETIES.

Columbus.
Red Jacket.
Triumph.
Whitesmith.

PLUMS.—38 VARIETIES.

Admiral Rigney.	Gold.	Saratoga.
Bailey's Japan.	Golden Beauty.	Satsuma.
Belle de Septembre.	Grand Duke.	Snelling's Seedlings.
Brunswick.	Hammer.	Splendor.
Chas. Downing.	Kingston.	Stoddard.
Comfort.	Lafayette.	Tatge.
Communia.	Lincoln.	Whitby.
Copper.	Milton.	Whittaker.
Czar.	Orient.	Wickson.
Dunlop.	Pottawattamie.	Wolf.
Early Green.	Purple Reine Claude.	Yellow Japan.
French Damson.	Red June.	Young Ken's Golden.
General Brock.	Richland.	

RASPBERRIES.—4 VARIETIES.

Columbian.	Loudon.	Superlative.
Gault.		

No. 7.—SIMCOE STATION.

APPLES.—29 VARIETIES.

Arabka 257.	Gravenstein.	Russell.*
Barry.	Haskell Sweet.*	Scarlet Pippin.*
Cooper's Market.	Jersey Sweet.*	Shiawassee Beauty.*
Dominie.	Lady.*	Stump.*
Downing's Winter Maiden's Blush.	Lead.	Sylvan Sweet.
Excelsior.	Mother.	Vandevere.
Fallawater.	Ontario.	Winstead Pippin.
Florence.	Pastuchofka.	Winter Aport.
Good Pheasant.	Peck's Pleasant.	Yellow Newton Pippin.*
	Richland Golden Sweet.	Imperial York.

BLACKBERRIES.—3 VARIETIES.

Ancient Briton.	Eldorado.	Wilson Junior.

CHERRIES.—5 VARIETIES.

English Morello.	Lutovka.	Sklanka.
Latham.	Mercer.	

CURRANTS.—1 VARIETY.

Black Champion.

GOOSEBERRIES.—1 VARIETY

Columbus.

PEARS.—10 VARIETIES.

Beurre d'Anjou.	Giffard.	Lawrence.
Clairgeau.	Idaho.	Sudduth.
Doyenne Boussock.	Kieffer.	Wilder.
Easter Beurre.		

PLUMS.—8 VARIETIES.

Abundance.	Japan.	Shensi.
Botan.	Ogon.	Willard.
Burbank.	Satsuma.	

RASPBERRIES.—3 VARIETIES.

Hilborn.	Loudon.	Souhegan.

RUSSIAN APRICOTS.—6 VARIETIES.

Alexander.	Budd.	Nicolas.
Alexis.	Gibb.	Purple.

*Scions.

STRAWBERRIES.—6 VARIETIES.

Aroma.
Beauty.
Brandywine.
Hunn.
Marshall.
Wm. Belt.

No. 8.—EAST CENTRAL STATION.

APPLES.—37 VARIETIES.

Alexander.
America.
American Pippin.
Arkansas Red.
Baldwin.
Belle de Boskoop.
Ben Davis.
Bethel.
Canada Red.
Cayuga Red Streak.
Chenango Strawberry.
Downing's Winter Maiden Blush.
Duchess.
Fameuse.
Gideon.
Gravenstein.
King.
LaRue.
Longfield.
McIntosh Red.
Maiden's Blush.
Mann.
Newtown Pippin.
N. W. Greening.
Red Bietigheimer.
Shackleford.
Salome.
Stark.
Stump.
Sutton Beauty.
Tetofsky.
Transparent.
Utter's Red.
Walbridge.
Wealthy.
Winesap.
Wolf River.

PEARS.—59 VARIETIES.

Angel.
Bartlett.
Belle Lucrative.
B. S. Fox.
Bergamot Esperen.
Beurre Besc.
Beurre Clairgeau.
Beurre d'Anjou.
Beurre Hardy.
Charles Ernest.
Clapp's Favorite.
Comice.
Compte de Chambord.
Compte de Lambertye.
Conference.
Dempsey.
Docteur Jules Guyot.
Dorset.
Doyenne d'Ete.
Duchess d'Angouleme.
Duchess de Bordeaux.
Duchess Precoce.
Eastern Belle.
Fertility.
Flemish Beauty.
Fred Baudry.
Garber.
Goodale.
Idaho.
Japan Golden Russet.
Josephine de Malines.
Koonce.
Kieffer.
Krull.
Lady Clapp.
Lawrence.
Le Lectier.
Lincoln.
Lincoln Coreless.
Louise Bonne.
Madame Hemminway.
Margaret.
P. Barry.
Pitmaston Duchess.
President.
President Druard.
Ritson.
Rutter.
Seckel.
Seneca.
Sheldon.
Sudduth.
Tyson.
Vermont Beauty.
Wilder.
Wilder Early.
Winter Nelis.
Worden Seckel.
Zoe.

NUTS.—ONE VARIETY.

Giant Chestnut.

RASPBERRIES.—1 VARIETY.

Columbian.

No. 9.—BAY OF QUINTE STATION.

APPLES—50 VARIETIES.

Arkansas Beauty.*
Barry.
Beauty of Bath.
Beecher's Red Crab.*
Bismarck.
Boy's Delight *
Carlough.*
Downing's Winter Maiden Blush.
Eicke.*
Flory.*
Garfield.*
Garden Gem.*
Hamilton.*
Malinda.*
Minkler.*
Mammoth Black Twig.
Paragon.*
Parlin.*
Scarlet Pippin.*
Springdale.*
Walter Pease.
Walbridge.
Western Beauty.
Wellington.
Winter Banana.*
Winter Fameuse.*
York Imperial.*

Special Collection of apples from C. H. Shinn, A.B., Inspector of Exp. Station of University of California, Berkeley, Cal.

Ares Aphes.
Benton Co. Beauty.
Bush Seedling.
Duffey's Seedling.
Green Cheese.
Graiel.
H. Clay.
Ingram.
Isham.
Landsberger.
Landsberger Reinette.
Malding.
Nansemond Beauty.
N. W. Greening.
Old Gold Ridge.
Palouse.
Pioneer (Cal Seedling).
Pon Man's Fruit.
Waren Pippin.
Wharton.
Ukiah (Seedling).

NUTS.—1 VARIETY.

Giant Chestnut.

* Scions.

No. 10.—ST. LAWRENCE STATION.

Apples.—36 Varieties.

Alexander.
Blenheim Pippin.
Blunt.
Brockville.
Canada Baldwin.
Chenango Strawberry.
Downing's Winter Maiden Blush.
Enormous.
Gideon.
Golden Russet.
Hamilton.
Hibernal.
Hurlburt.
Late Strawberry.
Longfield.
McIntosh Red.
McMahon.
Magog Red.
Mathews.
Milwaukee.
Montreal Beauty.
N. W. Greening.
Ontario.
Peter.
Pewaukee.
Red Astracan.
Rochelle.
Roman Stem.
Salome.
Starr.
Sutton Beauty.
Whitney No. 20.
Windsor Chief.
Winter St. Lawrence.
Wolf River.
Yellow Transparent.

Pears.—20 Varieties.

Bergamot.
Bessemianka.
Beurre Clairgeau.
Beurre Hardy.
Clapp's Favorite.
Dempsey.
Early Bergamot.
Flemish Beauty.
Golden Russet.
Goodale.
Howell.
Idaho.
Keiffer.
Lincoln.
Lincoln Coreless.
Ritson.
Sudduth.
Varonesh.
Victorina.

Plums.—15 Varieties.

Chas. Downing
Comfort.
Communia.
Hammer.
Hughes
Lincoln.
Lombard.
Milton.
Montreal.
Moore's Arctic.
Pond Seedling.
Saunders.
Tatge.
Weaver.
Whittaker.

Raspberries.—1 Variety.

Columbian.

Strawberries—12 Varieties.

Aroma.
Beauty.
Bell.
Brandywine.
Bubach.
Greenville.
Hayfield.
Haverland.
Marshall.
Saunders.
Wm. Belt.
Woolverton.

No. 11.—STRAWBERRY SUB-STATION.

Strawberries.—41 Varieties.

Anna Kennedy (P).
Annie Laurie (S).
Apache (S).
Bismarck (S).
Champion of England (S).
Eleanor (S).
Erie (S).
Evans.
Glen Mary (S).
Hayden.
Holland (P).
Homestead.
Hull's No. 9.
Hull's No. 10.
Hunn (P).
Ideal (S).
Jarabolo (S).
Lincoln (P).
Maredian.
Maytrott's.
Michigan (S).
Naomi.
Noble.
No. 1000.
Ocean City (S).
Oriole (P).
Premium (P).
Ridgeway (S).
Satisfaction (S).
Sawlog (P).
Seedling A (Cooper's).
Seedling B "
Seedling C "
Seedling E "
Sparta.
Staples (S).
Sunrise (P).
Tubb's (S).
Warfield No. 4 (P).
World's Champion.
Zula (S).

No. 12.—GOOSEBERRY SUB-STATION.

Gooseberries.—56 Varieties.

Alice Hawthorn.
Belle de Meaux.
Broomgirl.
Candidate.
Cook's Eagle.
Criterion.
Crown Bob.
Dublin.
Early Oldham.
Early Rough Red.
Early Smooth Red.
General.
Green Chisel.
Green Rover.
Gunner.
Ingram's Ocean.
Ironmonger.
Jumbo.
Keen's Seedling.
Lady Leceister.
Lanceolet.
Lofty.
London.
Lord Crewe.
Mabel Morrison.
Madame Lefort.
Magistrate.
Magnet.
Major Oldham.
Monarch.
Napoleon the Grand.
Oldham.
Oregon.
Overall.
Printer.
Queen Victoria.
Railway.
Random.
Red Champagne.
Red Robin.
Roaring Lion.
Snowball.
Snowdrift.
Snowdrop.
Souvenir de Billard.
Success.
Swan.
Top Gallant.
Triumph.
Turkey.
Walnut
Warrington.
White Champagne.
Whitesmith.
Winham's Industry.
Yellow Champagne.

No. 13.—MAPLEHURST CHERRY STATION AND GENERAL COLLECTION FOR DESCRIPTIVE WORK.

Apricots.—7 Varieties.

Bougome.
Hubbard.
Montgamet.
Peach.
Royal.
Shensi.

Grapes.—24 Varieties.

Alice.
Barry.
Beauty.
Black Hawk.
Colerain.
Eaton.
Elvira.
Esther.
Gaertner.
Geneva.
Golden Drop.
Grein's No. 7.
Herbert.
Hayes.
Massasoit.
Merrimac.
Moore's Diamond.
Moyer.
Norton's Virginia.
Peabody.
Rebecca.
Rochester.
Rockwood.
Senasqua.

Mulberries—1 Variety.

Downing.

Nuts (Chestnuts).—4 Varieties.

Alpha.
Beta.
Giant.
Parry's Superb.

Cherries.—19 Varieties.

Abbesse.
Black Tartarian Improved.
California Advance.
Centennial.
Dyehouse.
Early la Maurie.
Hortense.
Ida.
Mercer.
Murdoch's Bigarreau.
Ostheimer.
Plymouth Rock.
Purity.
Rocky Mountain.
Royal Blue.
Sparhawk.
Suda Harvey.
Windsor.
Wragg.

Pears.—13 Varieties.

Beurre Clairgeau.
Clapp's Favorite (dwarf).
Fred Beaudry.
Garber.
Giffard.
Koonce.
Krull.
Pitmaston Duchess.
Pound.
President Mas.
Directeur Alphande.
Rutter.
Sudduth.
Wilder.

Plums.—15 Varieties.

Belle de Septembre.
Dunlap.
Goliath.
Ickworth Imperatrice.
Kingston.
Lafayette.
Lucombe's Nonsuch.
McLaughlin Orange.
Oullin's Golden.
Prune d'Agen.
Reine Claude Violette.
Royal Hative.
Transparent.
Wagenheim.
Young Ken's Golden.

QUINCES.—4 VARIETIES.

Bourgeat Early.	La Maurce.	Van Deman.
Fuller.		

SHRUBS.—11 VARIETIES.

Amur Barberry.	L'Alberti.	Russian Snowball.
Amur Tamaris.	Lonicera splendens.	Spiræa tribola.
Chinese Barberry.	L'Xylosteum.	Viburnum lantara.
Douglassii.	Nobleana.	

The Se retary also reported that he had secured from the Minister of Agriculture permission to use such bottles as were needed by the Board, and had proceeded during the summer to put up a selection of varieties of cherries and other fruits in preserving fluids for exhibition purposes. He had also secured a selection of strawberries and other fruits from Mr. E. B Stevenson, a few varieties of plums from Mr. John Mitchell, and some peaches from Mr. W. W. Hilborn.

This collection he had exhibited at the Industrial, being personally present to superintend it, as well as the exhibits of green fruits from the various stations. The Secretary presented the following report of the same :

THE FRUIT EXHIBIT AT THE INDUSTRIAL FAIR, TORONTO.

In accordance with the instructions of the Board of Control, your Secretary conferred with the Minister of Agriculture concerning the use of the bottles used at the World's Fair, for putting up a fresh exhibit of early perishable fruits for the Experiment Station exhibit at the Industrial. With his permission the Secretary proceeded to put up in chemicals early fruits, especially cherries, berries, peaches and plums. One dozen varieties of peaches were furnished from the North Western Station, one dozen varieties of plums from the Georgian Bay Station, thirty varieties of strawberries from the strawberry station at Guelph, some raspberries and blackberries from the Burlington Station, and the balance, to make up a total of over 150 bottles, were furnished by the Secretary.

During the first week of the exhibition the Secretary had this exhibit set in the Fruit Building at the Industrial, after having shelves built for the purpose, and was in attendance from Monday until Saturday of the second week to superintend the exhibit of fresh fruits from the various stations. In the case of the exhibit he secured especial assistance from A. M. Smith, W. H. Dempsey, Rev. E. B. Stevenson and H. L. Hutt. The exhibit consisted of :

	Varieties.
Bottled fruit	150
Apples, from Bay of Quinte Station	127
" St. Lawrence "	9
" Simcoe "	36
" Lake Huron "	33
" East Central "	35
Pears, from " "	33
Grapes, from Wentworth "	100
Peaches, from South Western "	25

Signs and placards were secured in order to explain the object of the exhibit, and attract notice ; and probably no part of the Fruit Building was more crowded than that part containing the exhibit of the Fruit Experiment Stations, and more especially the bottled fruit. This latter was loaned to the O. A. C. at Guelph for use in illustrating lectures in the classes in Horticulture.

SPRAYING EXPERIMENTS.

Mr. W. M. Orr, of Fruitland, Provincial Superintendent of Spraying Experiments, was present and gave a verbal report of his work, with some extracts from his written report. This report will be appended hereto, and published in detail. Mr. Orr explained that he had conducted these experiments in twenty-nine different points, and given six applications in each case. Fungus diseases had not been as widespread as usual in the year 1896, and yet there was a very evident difference between the trees sprayed and unsprayed, both with regard to foliage and fruit, as had been proved by careful count.

The Board agreed to suggest that if spraying experiments are to be continued in 1897, it might be well to ask experimenter to undertake some additional lines of work, in which treatment with kerosene emulsion would be required.

Mr. Hutt then read a full report of his vtsits of inspection to the various stations during 1896, and it was ordered that his paper be included in the annual report of this Board.

INSPECTION OF FRUIT EXPERIMENT STATIONS.

By H. L. Hutt, Official Visitor.

It was my pleasant duty during the summer to pay a visit of inspection to each of the Fruit Experiment stations now established, and it gives me pleasure to report that great progress has been made in the work since last year.

In my last report I dealt at some length upon the location and size of each station, the kinds of fruit-growing there, and the fitness of the men for carrying on experimental work. As all this need not he repeated, my report this year may be made considerably briefer and will treat more particularly of the additional planting that has been done and of the management of the work. A few notes were also taken as to the fruit crop at the various stations, and each experimenter was asked to give a short list of the varieties which from his past experience he would plant, if planting again for profit. These lists will be helpful as guides to intending planters, although in some cases they will, no doubt, be considerably changed when the newer varieties now under test come into bearing.

I shall speak of each station briefly in the order in which they were visited:

The Southwestern Station.

Visited on August 25th, 1896.—Mr. Hilborn has now in his orchard about 150 varieties of peaches, 50 varieties, three trees of each, having been added last spring. About 30 varieties were in bearing this year and will be described in his report. About as many more are expected to begin bearing next year. There were very few failures in this years's planting, and nearly all of the trees of both this year's and last year's planting have made a remarkably fine growth.

There are also thrifty young trees of 25 varieties of plums, 20 of cherries and 12 of apricots, which he will be able to report on as they come into bearing. The cherry trees this year were badly infested with the pear slug (*Selandria cerasi*). Both broods of this insect were unusually plentiful this year, and in spite of repeated applications of air slaked lime, did considerable damage to the foliage.

On account of the comparative failure with strawberries on his light, dry land for the past two seasons, Mr. Hilborn has thought best to give up growing this fruit until a moister or more suitable piece of land can be cleared up for the purpose.

Mr. Hilborn's orchards receive thorough cultivation up till the middle of August, and the fine growth his trees have made shows that he thoroughly understands their management. When questioned as to his choice of half a dozen varieties, Mr. Hilborn said he would not like to confine himself to so short a list, but if compelled to do so would select Early St. John, Early Crawford, Elberta, Late Crawford, Lemon and Smock. These varieties, early and late, as nearly as possible extend over the peach season.

As far as I could learn by visiting a number of peach orchards no true case of "peach yellows" has as yet appeared in this section. The majority of growers are very wisely on the watch for it, and are ready to pull up and burn any tree that looks at all suspicious.

The increase in value of peach lands in this section of late years rivals the boom in Rossland. The bare land, which six years ago could be bought for $85 per acre, is now selling for $150 per acre, while the same land planted with peach trees four years old is being held at $325 per acre.

The peach crop in this section this year was perhaps larger than ever, and good fruit was selling at from 60c to 75c per 12 quart basket. Strange to say Mr. Hilborn was getting his highest prices in the Hamilton market.

As an evidence that peach growing must pay in Essex, Mr. Hilborn is building a new house, which, when completed, will compare favorably with some of the stately residences of Grimsby fruit growers.

The Lake Huron Station.

Visited on August 27th, 1896.—The additional planting done at this station this year was as follows : 14 varieties of apples, all of which have lived and made a good growth ; 8 varieties of plums ; 6 varieties of cherries ; 5 varieties of blackberries ; 15 varieties black raspberries, and 20 varieties of red raspberries. With one or two exceptions nearly all of the trees have lived and made a good growth, and whatever spaces occur among the raspberries will be filled in the spring with plants propagated from those now growing.

All of the trees and plants have been well taken care of and have been neatly labelled.

Half of the bearing apple orchard, which was last year in sod, has been broken up and kept well cultivated. The marked difference on this half, in comparison with that on the uncultivated half, was enough to convince the most sceptical of the benefits of good cultivation in an apple orchard.

As in all other parts of the country the apple crop in this section was unusually large. The Ben Davis, Golden Russet, Mann and Fameuse in Mr. Sherrington's orchard were very heavily loaded.

A plot of 2½ acres adjoining Mr. Sherrington's has been purchased and will be cleared up and put in condition for further experimental planting.

The Georgian Bay Station.

Visited on August 28th. 1896.—Mr. Mitchell has a very fine orchard of plums, about four acres in extent, in full bearing. This contains 18 varieties which will be reported on from year to year. Thirty-five varieties, three trees of each, were added last year and 55 varieties more were added this year. When these all come into bearing some valuable information for plum growers may be looked for from this station.

What few trees have failed in this year's planting will be replaced by others in the spring. With the good care given them all of the trees living have made a very fine growth.

Among the varieties which Mr. Mitchell recommends for profit from his present experience are : Lombard, Glass' Seedling, Pond's Seedling, Coe's Golden Drop, Early Black Damson, Quackenboss, Washington, Bradshaw and Reine Claude.

Those varieties bearing the heaviest crop this year were : Damsom, Lombard, Yellow Gage, Quackenboss, Glass' Seedling and Reine Claude.

In addition to the plums Mr. Mitchell is trying a dozen varieties of pears, and a half-dozen of the hardiest varieties of peaches.

His apple orchard was hearing heavily. Those varieties carrying the greatest load were: Ben Davis, Golden Russet, Ribston Pippin, Pewaukee, Gravenstein, King, St. Lawrence, and Fameuse.

The Simcoe Station.

Visited on August 29th, 1896.—Considerable progress has been made in the work at this station. In addition to the 25 varieties of apples which Mr. Caston had in bearing, about 40 varieties were planted last year, and 16 varieties more were added this year. A number of other fruits are also being grown at this station to test their hardiness.

The additional planting this year consisted of 5 varieties of pears, 6 of plums, 5 of Russian apricots, 4 of blackberries, 5 of raspberries, and 6 of strawberries.

Great care had been taken in planting and very few of the trees or plants had failed. They had been well cultivated during the season and showed a good strong growth.

Mr. Caston has everything neatly labelled, and has made a map of his orchards, so that any variety under test may be readily located.

In Mr. Caston's bearing orchard the varieties most heavily loaded were Duchess of Oldenburg, Wealthy, Fameuse, Ben Davis, Golden Russet, Pewaukee and La Rue. The Duchess Mr. Caston finds to be one of his most profitable varieties. Sixty barrels of this variety were sold to customers about North Bay for $1.25 per barrel.

The following varieties are recommended for profit in this section: Summer—Duchess of Oldenburg; Autumn—Wealthy and Alexander; Winter—Fallawater, Mann, Bottle Greening, Northern Spy, King of Tompkins and Baldwin. These last three Mr. Caston prefers to be top grafted on Talman Sweets.

Bay of Quinte Station.

Visited on September 16th, 1896.—Over 150 varieties of apples have been under test at this station for some time. Ten new varieties, three trees of each, were planted this year, and the scions of 33 varieties were grafted into bearing trees. Twenty-five trees of Talman Sweets were planted this year for stocks on which to top graft new varieties which may be sent here for trial.

Mr. Dempsey's large orchard of 40 acres is well cared for, and is well worth seeing at any time. He manages to have half of his trees bearing one year and the other half the next, and in this way he has a fair crop to handle every year. His crop last year was about 1,800 barrels and he estimated the crop this year at 2,000 barrels.

Mr. Dempsey is a careful packer and successful shipper. His entire crop last year averaged $2.40 per barrel, most of them being sold right at his packing house during the winter.

Out of his long list of varieties under test he recommends the following for profit: Summer—Duchess of Oldenburg; Autumn—Trenton, Wealthy and Fameuse; Winter—Gravenstein, Blenheim Orange, Ontario, Ben Davis and Stark.

The St. Lawrence Station.

Visited on September 17th, 1896.—The plot of ground at this station devoted to the experimental planting is four acres in extent, sloping gently to the St. Lawrence River. It was planted this year with 36 varieties of apples, 16 of pears, and 15 of plums, three trees of each variety. Some few trees from American nurseries died, but all those from Canadian nurseries lived, and all of the trees living made a good growth. The spaces between the trees were planted with corn and potatoes and kept well cultivated. Care was also taken to prevent the attack of the pear slug, which has done so much damage to trees in other places.

Mr. Jones has all the new trees neatly labelled and has made a good map of the orchard with each variety properly located.

In his bearing orchard there was a fine crop of clean fruits, probably 500 barrels, made up mostly of Fameuse and Scarlet Pippin, a local variety of great beauty and promise.

By persistent spraying with kerosene emulsion, Mr. Jones has succeeded in ridding his orchard of the Cigar Case-bearer (*Coleophora Fletcherella*) which of late years has done so much damage in that section.

The East Central Station.

Visited on September 18th, 1896.—The additional planting at this station this year was three trees each of twenty-three varieties of apples, and twenty-nine varieties of pears. Ten varieties of French pear trees, too small for planting, were put into a nursery row for another year. There were very few failures among the trees planted and most of them made a very good growth. The land between the trees was cropped with corn and kept well cultivated.

A record has been made of the planting, and the trees well labelled with zinc labels, as has been advised at all stations where this has not yet been done.

A considerable part of Mr. Huggard's orchard is in sod and the rest of it cropped with grain and roots—not what we consider the best treatment for an orchard, but he intends to break up the sod and give the whole orchard clean cultivation.

The following is a list of the varieties of apples he recommends for planting in that section: Summer—Yellow Transparent and Duchess of Oldenburg. Autumn—Fameuse and Wealthy. Winter—Northern Spy, Baldwin, Rhode Island Greening, and Red Canada.

The varieties of pears recommended are as follows: Bartlett, Flemish Beauty, Beurré Clairgeau, Louise Bonne, Belle Lucrative, Goodale, and Keiffer.

The Burlington Station.

Visited on September 19th, 1896. This station is the centre of a very fine fruit section, and is well stocked with a large number of varieties of most kinds of fruit grown in Ontario.

The additional planting this year consisted of 20 varieties of blackberries and raspberries; 14 of currants; 7 of grapes; 18 of plums; and 20 of pears.

Mr. Peart is a first class fruit grower, and gives his orchards and fruit plantations the best of care. Under his good management there were very few failures among the fruits planted this year, and all living have made a remarkably fine growth.

The fruit crop here this year was not only large but of fine quality. From his own experience with what fruits he has in bearing, Mr. Peart recommends the following varieties for profit in this section:

Plums.—Of which he has 1,000 trees of 20 varieties in bearing: Lombard, Reine Claude, Washington, Imperial Gage, Yellow Egg, Glass' Seedling, and Quackenboss.

Pears.—Bartlett, Duchess, d'Angoulême (on dwarf stock), Beurré d'Anjou, and Clapp's Favorite.

Grapes.—Black—Concord and Worden. Red—Vergennes, Lindley, and Wyoming Red. White—Moore's Diamond.

Apples.—Duchess of Oldenburg, Ribston Pippin, Baldwin, Rhode Island Greening, and Northern Spy.

Blackberries.—Snyder and Western Triumph.

The Niagara Station.

Visited on September 27th, 1896. At this station, too, we have quite a list of varieties of a number of different kinds of fruits already in bearing. The additional planting was mostly of those kinds which have been considered more or less tender in this Province; the object being to find out what varieties may be profitably grown in the southern parts of the Province. Last spring's planting consisted of three trees each of the following: 50 varieties of peaches; 15 of cherries; 12 of plums; 8 of apricots; 3 of nectarines; 3 of mulberries; 10 of Japan chestnuts; and 1 of filberts.

Some few of the chestnuts and sweet cherries failed to grow, the stock being in poor condition when received. With the good care given them the greater part of the trees have done well, some kinds having made a very strong growth. Under Mr. Burrell's management they will have every chance possible. It remains to be seen how some of them will stand our climate.

A careful record has been made of the planting, and the trees will be labelled this fall with zinc labels.

If growing for profit, Mr. Burrell says he would plant the following varieties:

Peaches.—Early Rivers, Yellow St. John, Reeve's Favorite, Oldmixon, Steven's Rareripe, and Smock.

Cherries.—Sour—Early Richmond, Montmorency, and May Duke. Sweet—Knight's Early Black, Black Tartarian, and Windsor.

Pears.—Clapp's Favorite, Bartlett, Tyson, Beurré d'Anjou, Beurré Bosc, and Keiffer.

Plums.—Prince's Yellow Gage, Niagara, Bradshaw, Lombard, Washington, Coe's Golden Drop, and Reine Claude.

Grapes.—Black—Worden, Concord, and Herbert (Roger's 44). Red—Lindley, Agawam, and Vergennes. White—Niagara.

The Wentworth Station.

Visited on September 29th, 1896. In the large vineyards at this station there are about 80 varieties of grapes in full bearing; 28 additional varieties were planted last year, and 14 more this year. The young vines put out last year have made a strong growth and will be trellised next spring. Some of them bore a few bunches of fruit this year. The plum, cherry, and pear trees also planted last year have made a good growth.

All trees and vines have been neatly labelled with zinc labels.

Mr. Pettit is a thorough going fruit grower and gives his vineyards and orchards the best of care. His bearing vineyard this year was as heavily loaded as ever.

From his long list of varieties of grapes he would select the following as the most profitable: Black—Worden, Wilder, and Concord. Red—Lindley, Agawam, Delaware, and Catawba. White—Niagara, and Moore's Diamond.

Mr. Pettit has an extensive pear orchard in full bearing. He mentions the following varieties for profit, named in the order of ripening: Beurré Giffard, Bartlett, Flemish Beauty, Duchess d'Angoulême, and Keiffer.

Out of ten varieties of plums in bearing, the following are the choice for profit: Lombard, Washington, Bradshaw, Yellow Egg, and Reine Claude.

Strawberry Sub-Station.

This has been called the Halton sub-station because Mr. Stevenson is now located at Freeman, in Halton Co. His experimental grounds, however, are on the fruit farm of his father, near Guelph, which he visits frequently. I have had occasion to visit these grounds at different times during the season, and know that they contain much of interest to strawberry growers.

Mr. Stevenson knows not only how to grow strawberries successfully, but how to give a complete and intelligent report on them. In his last year's report, he carefully describes 90 varieties under test. Sixty-six new varities were fruiting with him this year for the first time.

Gooseberry Sub-Station.

On account of experimental work at the College which required my close attention during the small-fruit season, I was unable this year to visit our gooseberry station in Simcoe, managed by Mr. Stanley Spillet. Mr. Woolverton, our Secretary, found time to do so, however, and judging from his reports, as well as from my own observations on previous visits, I believe good work is being done and valuable reports may be looked for from this station.

The Secretary then proceeded to read his descriptive work on the "Fruits of Ontario," and invited careful criticism of the work by the members of the board. It was ordered that this report be adopted, and included in the report of the fruit experiment stations. This report appears on pages 1 to 40.

The annual reports from the various stations were then taken up and read by the Secretary. The balance of the salary for 1896 was ordered paid to those whose reports were received; and the delinquents were notified that their reports must be sent in by the 15th of November in future, in accordance with the terms of the agreement.

It was further resolved that the attention of all the experimenters be called to the importance of filling the station record blanks in dealing with the yield of the various fruits under various conditions.

REPORTS FROM THE STATIONS.

These will be classified as follows, for convenience of reference: Apples, pears, plums, peaches, cherries, grapes, currants, gooseberries, blackberries, raspberries, strawberries.

APPLES.—BAY OF QUINTE

W. H. Dempsey, Trenton,

Size.—S., Small, less than 1½ inches in diameter; M., Medium, 1½ to 3½ inches in diameter; L., Large,
Form.—An. Angular; Con., Conical; Cor., Corrugated; Ob., Oblate; Obl., Oblong; Obt., Obtuse;
Color.—B., Brown; Bh., Brownish; Bl., Blush; Blo., Bloom; Br., Bright; G., Green; Gh.; Greenish; Reddish; Rus., Russet; Sp., Splashed or Splashes; Str., Striped; Sun, on
Cavity.—S., Shallow; N., Narrow; D., Deep; B., Broad.

Variety.	Origin.	Fruit.		
		Size.	Form.	Skin. Color.
Fall Pippin	United States	L	rh. obt	yh. g., often with bh. bl., many w. dots in sun.
Golden Sweet	Connecticut	M	rh ov	pale yel
Golden White	Russia	L	ov., unevenly ribbed.	rh. yel., nearly covered by pa. r. sp. and str. with deeper red.
Gravenstein	Gravenstein in Holstein, Germany.	M	ob an	br. red well str. and sp. r. and o.
Hubbardston Nonsuch.	Hubbardston, Mas.	M	r ov	y. nearly covered with broken stripes and nu. dots of light r.
Munson Sweet	Uncertain probably Massachusetts.	M	ob	y. with a b. bl. in sun
McIntosh Red	John McIntosh, Dundela, Ont.	M	rh ob	y., nearly covered with dark r., alp. in sun.
Mann	Judge Mooney, Granby, N.Y.	M	rh ob	y. with b. r. sun, and nu. light g. dots.
Pewaukee	Seedling of Duchess by Geo. P. Pepper, of Pewaukee, Wis.	M-L	ov	y. str., spl. with light and dark r., numerous g. dots covered with a grayish bloom.
Plumb's Cider	Uncertain, introduced by J. C. Plumb, Milton, Wiss.	M	obl. ov	gh. y. shaded and spl., str. with r., a few light dots.
Rhode Island Greening.	American	M	rh. ob	g., becoming greenish y., dull b., bl. in sun.
Roxbury Russet	Massachusetts	M	rh. ob	g., partly covered with rus
Ribston Pippin*	Ribston Hall, near Knaresborough, Eng.	M	rh. con	y., nearly covered with broken streaks and stripes of r., sometimes quite rus.
Stuart's Golden	Wm. Stuart, Rush Creek, O.	M	ob	bright y., little brown and w. dots.
Sops of Wine	English	M	rh	y. spl, and shaded with deep r., nu. w. and g. dots.

* Supposed to have been one of a number of seeds from Rouen, and planted at Ribston Hall 1688, and

EXPERIMENT STATION.—1896.

EXPERIMENTER.

over 3½ inches in diameter.

Ov., Ovate; R., Round; Rh., Roundish; Rib., Ribbed.

Nu., Numerous; O., Orange; P.o., Pale Orange; P., Purple; Ph., Purplish; Pa., Pale; R., Red; Rh., sunny side; W., White; Wh., Whitish; Y., Yellow; Yh., Yellowish.

	Fruit.							
						Flesh.		
Cavity.	Stem.	Basin.	Calyx.	Weight.	Core.	Color.	Texture.	Flavor.
D	3¼ in., heavy.	round, deep.	open ...	3½ oz...	conical..	white ..	tender, mellow	rich aromatic.
D	1 to 1½ in	deep ...	closed ..	3 oz....	ovate...	y. white	tender.	sweet .....
S	1 to 1¼ in	rib. deep	open ...	3 oz....	ovate...	white, streaked with red	tender, crisp, coarse grain.	sub-acid.
D	3¼ to 1 in heavy	wide, deep	closed ..	3 oz ..	conical..	white ..	tender, crisp, juicy....	rich, agreeable, aromatic.
ND	¾ inch ..	ribbed..	open ...	3 oz....	ovate...	.....	tender, juicy	slightly sub-acid.
BD	¾ inch ..	small ..	closed ..	2½ oz...	oblate .	yel. w..	tender	sweet.
S	¾ inch ..	small ..	closed ..	2½ oz...	ovate. .	white ..	very tender	mild, sub-acid.
D	½ to in	large ..	closed ..	3 oz....	oblate .	yel. w..	crisp	sub-acid.
S	½ in only not often	medium	closed ..	3½ oz...	small, ovate	white ..	breaking tender	juicy, sub-acid, aromatic.
SN	½ inch..	small, cor.	closed ..	2¾ oz...	large, ov	gh. w...	tender	mild sub-acid.
D	¾ inch..	small, cor.	closed ..	3 oz....	oblate..	yellow..	tender, juicy, crisp....	sub-acid.
S	½, ¾ in..	round..	closed ..	3 oz...	oblate .	gh. w...	crisp	sub acid.
B	½ to ½ in	irregular.	closed ..	2½ oz...	ovate...	yellow..	firm, crisp.....	rich aromatic.
S	½ inch, small.	broad ..	closed ..	2 oz....	small, ovate	w. y....	tender, juicy..... ...	pleasant, sub-acid.
N	1 inch, slender	shallow.	closed ..	2½ oz...	ovate...	w. with streaks red.	tender.....	pleasant, sub-acid.

planted in the Park. The original tree stood till 1810, when blown down; propped up; lingered till 1835.

COMMERCIAL

EAST CENTRAL STATION RECORD.—

Variety.	When planted.	Soil.	Cultivation.	Fertilizers used.	Date of pruning.	Name.
Astrachan	1876	Clay loam	meadow	coal ashes	Mch. '96	bark lice codling moth.
Early Harvest	1876	"	cultivated	stable manure	"	"
Duchess of Oldenburg	1880	"	meadow	coal ashes	"	"
Kentish Fillbasket	1879	"	"	"	"	"
Chenango Strawberry	1884	"	"	"	"	"
Wealthy	1886	"	cultivated	manure and ashes.	"	"
Haas	1876	"	"	manure	"	"
Twenty Ounce Pippin	1876	"	meadow	coal ashes	"	"
Fameuse, Snow	1876	"	"	"	"	"
Grime's Golden	1876	"	cultivated	stable manure	"	"
Fall Pippin	1876	"	"	"	"	"
Holland Pippin	1876	"	"	"	"	"
Ribston Pippin	1880	"	"	"	"	"
Boston Star	1876	"	meadow and cultivated	coal ashes and manure.	"	"
Belle Fleur	1876	"	cultivated	manure	"	and tent caterpillar
American Golden Russet	1876	"	meadow	coal ashes	Spg. '96	codling moth and bark lice.
Swazie Pomme Gris	1879	"	"	"	"	"
Princess Louise	1888	"	"	"	"	"
Rhode Island Greening	1876	"	"	"	"	tent caterpillar
Baldwin	1876	"	"	"	"	moth and lice.
Northern Spy	1876	"	"	"	"	"
Wagner	1876	"	"	"	"	"
Salome	1889	"	"	"	"	"
Blue Pearmain	1884	"	cultivated	manure	"	"
Tolman Sweet	1876	"	"	"	"	"
Swaar	1888	"	meadow	ashes	"	"
Minkler	1879	"	"	"	"	"
Pewaukee	1830	"	"	"	"	"
Canada Red	1880	"	"	"	"	"
Ontario	1880	"	"	"	"	"

APPLES.

R. L. Huggard, Whitby, Experimenter.

Insects. Treatment.	Date of maturity.	Date of gathering.	Yield.	Grade. Class 1.	Class 2.	Class 3.	Place of storage.	Date of decay.	Average price.
			bbls	bu.	bu.	bu.			bbl.
ash lye and Bordeaux mixture.	Aug.	Aug. 16....	2	60	40	....	barn cellar....	Sept. 20..	$1 50
"	July and Aug.	" 1....	1½	50	20	30	"	" 20..	1 00
"	Aug. and Sept	Sept. 1....	2	60	20	20	"	.....	1 25
"	Sept	" 12....	1	60	40	....	"	.....	.....
"	.....	.....	1½	75	25	....	"	Nov. 1..	50
"	....	Sept. 3....	2	40	60	....	"	.....	not sold
"	....	" 17....	4	50	50	...	"	.....	"
"	Oct. to Jan ..	.....	½	80	20	....	"	.....	"
"	" ..	Sept. 18....	3	75	20	5	"	.....	"
"	Dec. to Mch..	" 20....	1	90	10	....	"	.....	"
"	Oct. to Jan ..	" 16....	1½	40	60	....	"	.....	"
"	Aug. to Nov .	" 21....	1	80	20	....	"	.....	"
"	Nov. to Apl..	" 8....	3	75	25	....	"	.....	"
"	Oct. to Dec ..	" 19....	3	70	30	....	"	.....	"
"	Dec. to Feb ..	Oct. 6....	4	60	10	30	"	.....	"
"	Dec. to May..	" 3....	1½	70	30	....	"	.....	"
"	Jan. to May.	" 6....	1	80	20	....	house cellar ..	.....	"
"	Dec. to Feb ..	Sept. 15....	1	70	30	....	barn cellar....	.....	"
"	" ..	Oct. 1....	3	60	30	10	"	.....	"
"	Jan. to Apl ..	" 8 and 9.	2½	70	30	....	"	.....	"
"	" ..	" 16 and 17	1½	60	40	....	house cellar ..	.....	"
"	Nov. to Feb..	" 9....	1	60	30	10	barn cellar....	.....	"
"	Jan. to May..	" 17....	*	.....	....	....	.....	.....	.....
"	Dec. to Mch..	" 1....	1	50	30	20	barn cellar ..	.....	not sold
"	Nov. to Apl..	" 17....	2	60	20	20	house cellar ..	.....	"
"	Dec. to Mch..	" 10....	½	70	30	....	barn cellar....	.....	"
"	Dec. to Apl ..	" 5....	1	90	10	....	"	.....	"
"	Jan. to Apl ..	" 17 ..	2	80	10	10	"	.....	"
"	Dec. to Apl ..	" 12 ..	2	90	10	....	"	.....	"
"	Jan. to May..	" 12....	1½	80	20	....	"	.....	"

*Have only one tree, only few on, all good.

APPLES.—TESTED AT EAST CEN-

R. L. Huggard,

Habit.—S., Spreading; U., Upright; D., Drooping. Size.—S., Small, less than 1½ inches
Cavity.—S., shallow; N., Narrow;

Variety.	Origin.	Tree.		Fruit.			
		Habit.	Age of bearing.	Size.	Form.	Color of skin.	Cavity.
Blue Pearmain		S	5	L	round, obl	bluish red, yellow spots	SN
Boston Star	American	U S	7	L	roundish..	greenish yellow	S
Chenango Strawber'y	Lebanon, N.Y.	S	2	M L	obl. con ..	yellow with red strip..	ND
Early Harvest	American	U S	6	S M	roundish .	yellow	S
Holland Pippin	American	U S	10	L	roundish..	greenish yellow	D
Kentish Fillbasket	English	U S	10	L	roundish..	white with red cheek	S
Minkler	Illinois	U S	7	M	r. conical.	green and r. light spots	SN
Princess Louise	Canadian	U	7	M	r. conical.	yellow, with very red cheek	D
Salome	Ottawa, Ill	S	6	M	r. conical.	yellow and red	ND
Swaar	American	U S	9	L	r. obl	greenish yellow	S

APPLES.—TESTED AT SIMCOE

G. C. Caston,

Bogdanoff	Russian	S	4	M	r. oblate..	green, splashed and shaded with dull red.	D B
Hare Pipka	Russian	S	6	L	conical ..	red	M
Kean's Seedling	Seedling of Duchess, at Orillia.	S	4	M L	r. oblate..	streaked and splashed with red.	M

APPLES.—TESTED AT St.

Harold Jones,

Brockville Beauty	County Leeds, Ont., near Lyn.	S		M	obl. con ..	white, splashed and streaked with bright red.	S N
Scarlet Pippin	Seedling on the Caldwell Farm, Co. Leeds, near Brockville.	U		M	oblate....	white, nearly covered with bright red and deep crimson in sun.	S

APPLES.—TESTED AT HURON

A. E. Sherrington,

Colvert		S		M L	R. oblong	greenish yellow, splashed with red.	B D
Lowell Pippin		S		L	conical ..	yellow	N
Rambo	America	U		M	R. oblong	yellow, streaked with red.	S

RAL EXPERIMENT STATION.—1896.

EXPERIMENTER.

in diameter ; M., Medium, 1½ to 3½ inches in diameter ; L., Large, over 3½ inches in diameter. D., Deep ; B., Broad.

Fruit.							Remarks.
Stem.	Basin.	Calyx.	Core.	Skin. Color.	Skin. Texture.	Skin. Flavor.	
½ inch..	small...	closed ..	M	deep yellow	very firm, juicy	spicy and very sweet.	
½ inch..	small...	closed ..	S	yellowish	crisp, coarse	sub-acid.....	
½ inch..	large ..	closed ..	L	white	tender, juicy	melting	
¾ inch..	small...	open ...	S	white	tender	sub-acid.....	
¾ inch..	narrow.	closed ..	M	white	mellow	rich and mild ..	
¾ inch..	small...	open ...	L	white	tender	sub-acid.....	
1 inch..	medium	closed ..	S	yellowish white.	firm, juicy.....	sub-acid.....	
¾ inch..	narrow .	open ...	M	yellowish white.	crisp and juicy	mild, sub-acid..	
¾ inch..	small...	closed ..	S	white	firm and crisp	rich, sub-acid ..	
¾ inch..	shallow.	closed ..	S	white	tender, fine grained.	rich and sub-acid	

EXPERIMENT STATION.

EXPERIMENTER.

1 in. long	shallow, irregular.	partly closed	.....	yellow	firm, crisp.....	only medium ...	have better seedlings.
M	M	l., partly closed	.....	white	coarse.....	only fair	.....
S	shallow.	shallow.	.....	"	crisp, juicy	good	.....

LAWRENCE STATION.

EXPERIMENTER.

½ in., m. st., in. one side d. easily	shallow.	small, closed.	¾-⅞ inch, closed.	white	tender, juicy, fine grained.	brisk, sub-acid.	see plate.
½ inch, fleshy, in. one side.	shallow, broad, even.	open ...	oblong, 1 x ½ in. closed.	white, sometimes streaked with red lines.	firm, juicy, very fine grained.	sub-acid	see plate.

EXPERIMENT STATION.

EXPERIMENTER.

½-¾ inch	B	open ...	.....	white	firm.....	sub-acid.....	.....
¾-1 "	B	pt. clos'd	.....	yellowish white.	tender, juicy.....	"	.....
1-¾ "	S	"	.....	white	crisp, juicy	mild sub-acid ..	.....

APPLES.—BAY OF QUINTE STATION RECORD FOR 1895.

W. H. Dempsey, Trenton, Experimenter.

Variety.	When planted.	Soil.	Cultivation.	Fertilisers used.	Date of pruning.
*American Golden Russet	1879	loam	cultivated till August ..	bone and ashes	April.
Fall Queen (Haas)	1882	sandy loam .	" ..	phosphate	Mar..
Grand Sultan	1884	" ..	" ..	bone and ashes	May .
Golden White	1888	" ..	" ..	"	May .
Golden Sweet	.....	" ..	plowed	stable	April.
Gravenstein	1882	" ..	cultivated till August ..	"	May .
*Hurlbut	1882	" ..	" ..	"	May .
Hastings	top graf'd. 1880	" ..	" ..	"	May .
Jonathan	top graf'd. 1880	" ..	" ..	.....	April.
Munson Sweet	.....	" ..	sod	.....	Mar .
McIntosh Red	1882	" ..	cultivated	.....	Mar .
*Mann	1882	" ..	"	stable	Mar .
Pewaukee	1882	" ..	cultivated till August..	" and bone...	May .
Plumb's Cider	1881	" ..	" ..	stable	Mar .
Rhode Island Greening..	1882	gravelly	" ..	"	June.
*Roxbury Russet.....	1876	sandy loam..	" ..	"	May .
Ribston Pippin.....	1882	gravelly	" ..	"	May .

APPLES—BAY OF QUINTE—*Continued.*

Variety.	Thinning—per cent. by hand or accident.	Time of blooming.	Date of gathering.	Yield.	Grade. Class 1.	Grade. Class 2.	Grade. Class 3.	Average price.	Remarks.
	bu.			bu.	bu.	bu.	bu.	bbl.	
American Golden Russet.	.....	May 9..	Oct. 20.	6	3	2	1	$3 00	March, 1896.
Fall Queen (Haas)	.....	" 8..	Sept ...	4	3	½	½	1 00	.....
Grand Sultan	.....	" 8.	Aug ...	4	3	1	.....	1 00	Dwarf tree.
Golden White	.....	" 8..	Sept ...	3½	3	.....	½	75	.....
Golden Sweet	... ...	" 7..	" ...	16	14	1	1	50	... .
Gravenstein	.....	" 6..	" ...	4	3	½	½	1 50	.....
Hurlbut	1	" 9..	Oct	7	6	½	½	2 00	1895 crop.
Hastings	1	" 8..	"	15	12	2	1	1 00	.....
Jonathan	½	" 9..	"	6	5	1	....	2 00	1895 crop.
Munson Sweet	½	" 6..	Sep. 29.	15	12	2	1	50	....
McIntosh Red	1	" 7..	Oct	7	6	½	½	2 00	1895 crop.
Mann	½	" 8..	"	4	3	½	½	3 25	"
Pewaukee	2	" 9..	"	12	10	1	1	2 00	"
Plumb's Cider.....	2	" 8..	"	21	17	.....	4	50	....
Rhode Island Greening..	½	" 8..	"	8	6	1	1	1 00	.....
Roxbury Russet	2	" 9..	"	10	8	1	1	2 50	1895 crop.
Ribston Pippin	¼	" 7..	"	2	1¾	....	¼	1 50	....

* Stored in fruit house at a temperature of from 30° to 36°.

NOTES BY EXPERIMENTERS.

St. Lawrence Station.

I have planted this year for experimental purposes 34 varieties of apples, 21 of Pears, 15 of plums, and 11 of strawberries. The names of these will be found in the accompanying table, with the exception of the strawberries of which I will mention later on. There was very little to report this year on varieties just planted, but it will be interesting to watch the progress of the trees under a system of cultivating the land to hoed crops of different kinds for the first few years.

Of the 12 varieties of strawberries sent me 11 lived and grew well making a good stand of plants for fruiting next year. Varieties are :

1. Aroma (*S*) —Stooled out in the hill but made very few runners, foliage free of rust, and healthy.

2. Bubach No. 5 (*P*).—Medium leaf, moderate runner, traces of rust, seems vigorous.

3. Brandywine (*S*) —Large healthy foliage, no rust, free runner, very vigorous.

4. Beauty (*S*) —Medium leaf, free runner, some rust, vigor moderate.

5. Belle (*S*).—Medium leaf, some rust, very vigorous and makes runners by the hundred, needs thi- ning to give fruit a chance to develop.

6 Grenville *P*) —Medium leaf, moderate runner, no rust.

7. Haverland (*P*).—Medium to large healthy leaf, no rust, moderate runner.

8. Marshall (*S*) —Broad leaf, rusted, stools out for the first 2 or 3 months after planting and then runs freely.

9. Saunders (*S*).—Medium leaf, rusted, runs freely making an abundance of new plants.

10. Woolverton (*S*).—Large ribbed leaf, rusted badly, moderate runner.

11. Wm. Belt (*S*) —Seems identical in growth and character with Woolverton, but may show differently in the fruiting season.

The plants are set in a rather stiff clay loam manured heavily with barnyard manure. The season was favorable for a good growth having plenty of rain in every month except the early part of May.

Apples Under Cultivation and now Bearing.

Alexander.—Origin, Russia. This apple is not very largely cultivated in this section, but will likely become a favorite fall variety when better known.

Brockville Beauty.—Origin, Leeds Co. Ont. Not quite so hardy as the Fameuse but succeeds well in this section and is a favorite summer variety. Fruit should be thinned on the tree to allow the crop to fully mature and ripen.

Canada Red.—A long lived spreading tree. Should be planted 40x40 to get good results ; not very productive and takes 12 or 14 years to come into bearing. Fruit is of only medium quality, but its long keeping qualities and fine appearance makes it a fair market sort.

Duchess of Oldenburg.—Origin Russia. Its hardiness, productiveness, and handsome appearance makes this apple a general favorite. It is highly esteemed as a cooking variety, and ranks first as a market sort, in its season.

Fameuse.—The standard variety here. For productiveness and high quality of its fruit we have very few to equal it and none to excel. The foliage and fruit are subject to spot, but by spraying with Bordeaux we are able to overcome the only serious defect in this noble tree.

La Rue.—Origin, Leeds Co., Ont. When grown is sod it takes nearly as long as the Spy to come into bearing, but usually its bearing age is about 9 years largely planted in this section as its large size and handsome color makes it a good market sort. Subject to spot, and will crack open if trees are not carefully sprayed.

Scarlet Pippin.—Origin, Co. Leeds. This is an apple that gives promise of being a close rival to the Fameuse both in productive qualities and as a market sort. The fruit is above medium in size, oblate in form and the skin is a white waxy ground covered with a bright red or crimson. This year it gave me 25 cents per barrel more than my first-class Fameuse.

Talman Sweet.—Quite a popular variety here. Keeps well and is valued by many as a baking apple. Though very productive it is not a profitable apple to grow.

Wealthy.—Origin, Minnesota. This apple is hardly as good a keeper as the Fameuse, but is in good condition, kept in a cool cellar, until Christmas. Should be picked about the 5th to 10th September here, and shipped in that month. Tree a good bearer of even sized fruit, but inclined to split at the crotches, and shows indications of blight in some cases.

Yellow Belleflower.—A highly prized variety on account of the fine flavor and tender breaking flesh. It is a good keeper, but does not command as high a price on the market as it should on account of its lack of color. Tree a moderate bearer, but profuse bloomer; partially self-sterile. I have never been able to get a full set of fruit although I have several varieties rich in pollen and blooming at the same time set close by.

St. Lawrence.—A fine large apple of handsome appearance, liable to spot and crack if not sprayed. A good market variety, a favorite here.

Memo. of Blooming Period.

May 11.—Duchess of Oldenburg.

May 12.—Red Astrachan, St. Lawrence, Fameuse, Scarlet Pippin.

May 14.—Brockville Beauty.

May 15.—Canada Red, Belleflower, Talman Sweet.

May 16.—Blue Pearmain, Golden Russett.

Spraying and Results.

On the 30th of April the buds on the apple trees were just bursting when I sprayed with Bordeaux mixture and Paris green for fungi, bud moth, and case bearer.

On May 2nd I first noticed the case bearer moving up to the tops of the opening buds when I sprayed with kerosene solution 1 to 12 of water with the result that whereas the trunks and limbs were covered with millions of these insects it practically exterminated the pest from my orchard as on close examination this summer I could only find two healthy specimens, and the most of the insects never left their winter quarters. Care should be taken in spraying with kerosene emulsion not to pump out the last few gallons, for if the emulsion was not perfect there would be a little oil on top floating that will injure both foliage and twig in the spring. I injured three limbs on three different trees by moking this mistake.

On May 23rd I found the oyster shell bark louse moving, and washed with kerosene emulsion 1 to 5 on the trunks and limbs with good results. Note the early date at which these insects moved. It is generally supposed that they move about the 1st of June, whereas a very warm spring evidently influences the hatching season.

On May 26th I sprayed Bordeaux mixture and Paris green for fungi and codling moth, and after that date I saw so little indication of spot that I did not repeat.

Fungi did not appear to any appreciable extent until about the middle of August, when it showed on the foliage of the Fameuse and Baxter.

In watching the development of the egg of the bark louse on the 24th May, I was pleased to see a minute parasite destroying the eggs by boring into the egg. It was black, and I could plainly see him after he had entered the egg. I was using a good glass at the time.

Twig blight has been troublesome in this section attacking the Duchess the most. I have only two cases to report, both Fameuse, which I intend cutting down and destroying by fire. I am in hopes before long we will be able to have a preventive for blight instead of the very unsatisfactory remedy prescribed at present.

HAROLD JONES.

SIMCOE STATION.

Most of the stock planted came through in good shape and made a fairly satisfactory growth, considering the circumstances of this somewhat exceptional year. The young trees planted two years ago, are all thriving, except the Red Canada ; and it has failed entirely and seems too tender here. According to Downing it is not worth growing, anyway. One of the young Russians bore one specimen this year—the Bogandoff. It is evidently a winter variety ; size, medium ; round oblate ; skin, green, splashed and dotted with dull red ; stem an inch long, set in a deep wide cavity ; calyx partly closed in a shallow irregular basin ; flesh firm, crisp, but lacks flavor. There are plenty of better seedlings than this apple. Another Russian, the Hare Pipka, received from the central experimental farm, Ottawa, some few years ago, has borne this year. This variety is evidently an early and abundant bearer. It is of the Alexander type and family, and resembles it very much, but is not quite so large. Tree very healthy, vigorous, hardy ; fruit large, conical ; color greenish yellow, thickly overspread with red ; stalk medium, set in a moderately deep cavity ; calyx partially closed in a medium basin ; flesh coarse, white ; flavor only fair ; good for cooking. It will be no improvement on Alexander, unless it may be in the matter of earlier bearing.

One valuable characteristic of these Russian varieties is that they are all or nearly all very hardy, so that if the fruits prove inferior they will no doubt make excellent stocks for grafting such varieties on as Spy, Baldwin, King, Greening, etc. We are growing too many varieties now, and that is one of the troubles with apple culture in this province. There is a great deal of stuff grown that nobody wants, while the best varieties never go begging for a market. Golden Russet is a very unsaleable variety, except for export late in the winter, and only large exporters have the facilities for doing this. The most popular winter apple is the Northern Spy, and if people would graft their unsaleable varieties while still young with Spys, Kings, Baldwins, Ribston and Blenheim Pippins and Greenings, they would always find a ready market for them. Besides, it is the only certain and successful way of growing these varieties here. It is because these varieties have proved tender and short-lived that people avoid growing them in this district, and are growing too many varieties that are not wanted, such as Early Harvest, Tetovsky, Astrachan, Fall Pippin, Keswick Codlin, Haas, Wallbridge, and others that are practically unsaleable. We should aim to grow the apples that have the most commercial value, and study how to grow them successfully and profitably, and teach others how to do it. A year of over-abundant crops like this, teaches a valuable lesson as to the value of varieties for market. In the British market we find the well known Ribston and Blenheim Pippins away up in price, equal with our Fameuse and King. Both these apples do well here, the Blenheim being a shy bearer while young ; but both of these grafted on our hardy kinds would give early and profitable crops. They are both clean skinned, and the Blenheim as grown here is certainly a very handsome apple, and being such a favorite with the British consumer they are likely to be always in demand. Speaking of the home market, I find these to be the most popular sorts. The best early apple is undoubtedly the Duchess, but more of them are grown about here than there is a market for. But if ever facilities are provided to get them to an outside market they will be the most profitable apple grown here. I sold most of mine this year at a better price

than the winter apples—$1.25 per barrel f.o.b. for choice selected. We have many excellent fall apples, the most saleable being Alexander, Wealthy and St. Lawrence. These do remarkably here and are very popular. In winter apples the most popular for home market, away ahead of all others, is the Northern Spy. Its chief fault is its tender trunk and the long time it takes to come into bearing. But when top-grafted on a healthy, hardy stock it bears in from five to seven years, and the man who catches on to this and puts it into practice will be "in it." Next in order come King, Baldwin, Ribston, Blenheim, and Greening. Fallawater and Canada Red sell fairly well. The Pewaukee is a fairly good winter apple, but drops early from the tree. I will not recommend the Ben Davis to any one, although it still has value as an export apple, but I believe its poor quality and flavor must eventually tell against it. Locally, our dealers won't touch it at any price, as long as they can get anything else.

Apples, though a large crop this year, were a very fine sample, clean and large. The Snow, usually so affected with fungus scab, was clean, large and fine. This old well known variety is the most popular early winter dessert apple grown here, and a great favorite in the home market. It is also rising in favor and price abroad. On account of its liability to spot, the trees should be planted far apart and where possible on rolling ground, and well pruned, as this apple requires plenty of sunshine to attain to the greatest perfection. It should also be sprayed regularly with Bordeaux.

I did very little spraying this year and fortunately there was little need of it. Like many others I had planted my bearing orchard too close, and this year found it necessary to cut out a good many trees. With the press of spring work it was late for the first spraying before I got this done, so that I only sprayed the young trees and bushes. Next year I intend to give everything a thorough treatment.

Pears. I had a fair crop of the finest Flemish Beautys I ever saw; not a spot or crack in them. One plate shown in my collection at the "Industrial" at Toronto, was in the opinion of experts the finest sample shown at the fair, showing that this variety can be grown to great perfection here. The young trees of Flemish Beauty, Bessemianka, Bergamot and Baba are thrifty and making a satisfactory growth.

Plums. Fifteen varieties planted, all doing well. Two varieties fruited this year that were received three years ago from Ottawa. One of these the Rollingstone, is a small pink plum covered with a white bloom and of fair quality but very small. The other "Cheney" is larger and red in color but no better in quality than many of our common wild varieties.

Cherries. The Russian Cherries are very healthy and thrifty, and I have great hopes that we shall find in them something that will be a valuable acquisition to this section of the province. Two of these, the "Dye House" and "Bessarabian" two years planted, bore a few cherries this year. They were so much alike that I could see no difference in them. Both are sour cherries suitable for canning, are a little larger than Early Richmond, and when fully ripe are a very dark red in color, nearly as dark as the Black Oxheart. They are too sour, however, to suit my own taste, and I hope some of the other varieties of which I have about ten, will prove to be a little sweeter and less acid. But the point of value in these Russian Cherries is their hardiness, thrifty growth and freedom from disease, and as the growing of cherries has been almost entirely abandoned in this section, these new varieties, if they prove on further trial to be all that I except them to be, it will awaken a renewed interest in the growing of cherries all through this district. Next year if these cherries show any bloom I will prepare to make a careful record of date of blooming, growth and date of ripening, etc. The only insect pests troubling them was a kind of "slug" on the leaves. These were easily destroyed by spraying with the Bordeaux mixture, with Paris green added, 4 oz. to 42 gallons of the mixture.

Gooseberries. My soil is not suitable for them, and they are not doing as well as I would wish though they are well cultivated and manured. Downing, Houghton, Smith's Improved and Pearl are thrifty and growing but have not borne any fruit yet, with the exception of Houghton which bore a full crop this year. Red Jacket and Industry are both total failures here.

Blackberries. Of these the Snyder has been growing here for years, is perfectly hardy and bears well, but I want something of better quality. I have some seven varieties under test, but none of these have borne as yet. I expect next year to be able to make a comparative test as to the quality of these different varieties.

Raspberries. The Cuthbert is still queen of the market but rather late. And the Marlboro' comes in for the early crop. I have some twelve varieties of raspberries under test, but most of them are too young for purposes of comparison as yet, although several bore this year. Of these two deserve special mention, Smith's Giant and Columbian. The first a black cap and the other a cross between red and black, very much like the Shaffer. Smith's Giant is a good bearer. The fruit large and firm, but not of high quality. It is hardy, however, and last winter was exposed to a temperature of 25 below zero without any damage to the canes. The Columbian is a prodigy in point of yield. It seems perfectly hardy and vigorous in the canes, and the berries are about the same size and color as Shaffer, and it would be difficult to distinguish any difference in the appearance of the fruit, except that the Shaffer is possibly a little darker in color, while the Columbian is a little firmer of the two. They are a good berry for canning, and everyone who grows raspberries should give the Columbian a trial. If it does as well next season as it has this, I will have no hesitation in recommending it for general planting.

Currants. Of the twelve varieties under test I can say only that they are well manured and cultivated, and are growing well, some bearing a little fruit, but on the whole not enough for comparative purpose as yet. I propose to try the experiment of heavy mulching for black currants instead of working the soil about the roots, and compare the results with others of the same age, which are kept cultivated strawberries. Of all the new varieties tested, few, if any, are any improvement on the well-known varieties. Many of the new ones give very large berries, but come very far short in point of yield. While there are many that in point of quality excel the Crescent and Haverland, none of them come near them in yield in my experience. It is a question to be determined by the grower himself, whether it will pay him to grow the larger and finer kinds, if he can get a higher price for them or to grow the smaller though more prolific varieties at a less price. That will depend on what kind of a market he has. If it will take the larger kinds at a considerably higher price, it will pay him to grow them On the other hand if they would make little or any difference on the score of quality and size, then the more prolific kinds would be the most profitable to grow. Some of the new varieties such as Bubach, Warfield, Beauty Aroma, are pre-eminent in the healthiness of their foliage and freedom from rust.

A list of those tested which are considered worthy of culivation so far will be found in the tabulated statement.

G. C. Caston.

East Central Station, near Whitby.

Looking over past seasons I find the following results :

Apples. Apples that have yielded the most per tree in the past ten years : Haas, Wealthy, Boston Star, R. I. Greening and Baldwin, in the order named.

Apples that sold for highest price per barrel : Spy, Salome, Red Canada, Baldwin, R. I. Greening, Minkler and Golden Russett, in order named.

Apples that bear most regularly : Haas, Minkler, Twenty Ounce Pippin, Grimes, Golden Salome, R. I. Greening, Red Canada, in order named.

Pears. Varieties that have produced most fruit per tree for ten years are : Kieffer's Bartlett, Louise Bon de Jersey, Belle Lucrative, Howell.

Varieties that sell the highest : Doyenne d'Ete, Rostiezer, Bartlett, Sheldon, Duchess d'Angouleme, in order named.

Varieties that fruit most regularly : Kieffer's Hybrid, President Drouard, Bartlett, Josephine de Malines, Rostiezer, Flemish Beauty, in order named.

We have several varieties planted less than ten years, that I think may surpass those named in my list here.

The apple crop this season in this district has been exceptionally large, and the prices correspondingly low, but I notice in European reports prices are fair for No. 1 stock, and why shippers will forward anything but No. 1 stock this season I cannot imagine, as there is enough first class apples for shippers to send at paying prices. Just to-day a shipper here got returns for a car load he sent to Liverpool, and after paying all expenses, he netted just seven cents per barrel. The reason is very plain. The apples were not properly assorted, and were poorly packed, and were early fall fruit at that, so that when they arrived the juice was running out of the barrels. Apples in this district have been selling at from forty to sixty cents for fall fruit, fifty to seventy five cents for winter, and twenty cents per hundred pounds for evaporating.

In pears there has been a full supply, Bartletts generally taking the lead, although not much difference in price. Mostly all are sold in baskets, from twenty-five to thir y-five cents per basket. Some winter varieties being shipped in barrels are bringing $2.00 to $3.50 per barrel.

Plums. No plums were grown in this district this year and yet prices were very low, from thirty to sixty cents per twelve quart basket, which were mostly brought from Niagara district *via* the Toronto dealers.

Peaches. Peaches were also cheap as compared with former years ; all imported here *via* Toronto.

Grapes. Few grapes are grown, but samples shown were fine in size and quality.

Cherries were a medium crop but fine quality, and retailed here from $1.00 to $1.25 per twelve quart basket.

Goosberries were a remarkably fine crop both in quantity and quality, and no mildew.

Black Currants were not very good.

Strawberries were very fine for first picking, but dried up later on.

Altogether the season has been satisfactory, as regards quantity of fruit, but prices have ruled so low as to leave a very small margin for the producer.

Insects and fungi which formerly did serious injury, scarcely put in an appearance this season. Spraying has been pretty commonly practised and beneficial results have followed.

We all look for an improved system in grading, packing and marketing our surplus stock ; but the most essential part is to keep improving the quality, something about which I shall speak later on.

I have surrounded our new plots with Norway Spruce to serve as protection against wind when the trees are fruiting. I planted our apples thirty feet apart each way, and planted a pear in the angle between the apple rows. In this way I get 100 apples and 81 pears in a two acre plot, with a space on each outside, say 20 feet. Being accurate in planting, the rows of young trees look very beautiful when in foliage.

R. L. Huggard.

Georgian Bay Station.

Plums. We are rather short of material this year for a very full report, new varieties not in bearing and old ones nearly all described. There are now in test at this station ninety-seven varieties of plums from which in the course of a few years we expect to give some valuable information.

Yellow Egg —Vigorous upright grower, like Pond's Seedling. Branches smooth and long; should be headed in; bears well for that class of plum.

Yellow Gage.—Fairly vigorous, upright grower; sufficiently hardy and productive; rather poor shipper for distant markets.

Howard's Favorite.—Fine late plum; vigorous grower and early bearer; branches smooth; very hardy; regular bearer of good crops; good shipper.

Prince of Wales.—Vigorous; productive; hardy; branches somewhat downy; fruit large, often two inches in diameter; excellent quality; good shipper.

Early Black Damson.—Almost too well known to need description, but should not be confounded with the common, sour, blue, fence corner plums that are grown about the country. Extra hardy and productive. I have thirty trees of this variety, six years old, which the past season produced 140 twelve-quart baskets.

Japan Plums. In answer to many enquiries about Japan plums, we have not fruited any yet. They are good growers, and wintered well last year. There are several filled with fruit buds now, noticeably Burbank and Willard. All points considered, I would say, go slow with Japan plums.

Peaches. We have a few in test. Such varieties as Champion, Hales Early, Wonderful, Elberta, Fitzgerald and Tyhurst wintered to the last bud, and are now filled with fruit buds.

J. G. Mitchell.

Wentworth Station.

Fourteen varieties of grapes and a few plums have been added this year to the experimental planting. The trees have made a good growth this season.

On account of the late spring frost of 1895, the experimental plantation of grapes were all pruned back and not trellised this season. We now have a good growth of wood and expect next season to report on many of the new and untried varieties.

The season being rather dry has been favorable for grape growing, but the thrip has increased during these dry seasons very rapidly and has injured the Delaware and other thin leaved varieties very much; clean cultivation, the old remedy, is not a preventive.

The pear tree slug has been very bad this season. The eggs are laid early in June on the leaf by a four winged black fly; these hatch in about two weeks and become fully developed flies in about four weeks more, which propagate a second brood early in August, and are difficult to destroy on account of the danger of poisoning the fruit, which makes it important that the trees should be kept carefully sprayed with Paris green or Bordeaux mixture as soon as the first brood appears.

M. Pettit.

Niagara Station.

The following report, which I beg to submit to you, deals with fruits tested at this station and in the immediate vicinity. The annual loss to the fruit growers of Ontario from the attacks of various insect pests is so great that I have ventured to treat the subject briefly in the latter part of the report. There is a healthy and growing interest in this phase of horticultural work, and anything that can stimulate it may be of some value.

There have been planted at the station this year 266 trees, composed largely of peaches, but embracing many varieties of the sweet and sour cherries, plums (including the leading kinds of the Japanese type), apricots, nectarines, mulberries, and numerous Japanese chestnuts. With the view of determining the most suitable soil for the Japanese plums, some trees have been planted on a comparatively light sand, and others on heavier soil with a pretty stiff clay sub-soil.

PEACHES. The peach crop in this district was extremely light, owing to the unfavorable conditions of last winter.

Reeve's Favorite originated by Mr. Samuel Reeves of New Jersey, this is one of the finest of the newer varieties. It is a strong upright grower with dark green crinkled foliage. The fruit is very large, roundish, marked protuberance of calyx end; color, light yellow with red cheek; sature, indistinct; free stone; pit, medium size and deeply corrugated; firm texture; good flavor; season, a few days to a week later than Early Crawford. It bears fruit of a very uniform and large size. Some growers have found it a heavier bearer that Early Crawford. It has the reputation in Delaware of being shyer than Crawford, but they value it highly, and I think Reeve's Favorite should certainly have a good place in every orchard.

Wager, *Hill's Chili and Longhurst* came through in good shape, produced good crops. These varieties are much of the same type, though Wager is rounder and yellower as to fruit. The trees are moderate growers, foliage not luxuriant and of a narrow willowy leaf. The fruits are characterized by great downiness, a very free stone; flesh, of a firm, dry texture and with excellent canning qualities. Of other varieties here, Early Rivers, Barnard, Stevens' Rareripe, Early Crawford and Mountain Rose did best in the order of naming, but none of these produced anything like a crop.

Champion.—The new variety, will hardly, I think, be a profitable one to plant. Notwithstanding many good qualities, its white flesh, partial cling stone, and the fact that it matures about the season of the Early Crawford, must condemn it as a commercial fruit.

PLUMS. The varieties minutely described in this report are chiefly plums not generally grown, some of which deserve a more extensive planting. Several of them have been tested by Mr. Glass within a mile of the station, for more than twenty years.

Coe's Golden Drop.—A somewhat slow grower, but on account of its size, flavor, and time of ripening should secure a prominent place in all orchards. This, and Reine Claude de Bavay, I consider our most valuable late yellow plums.

Shropshire Damson.—Of English origin, and, in my opinion a valuable fruit, have found it very productive and quite hardy; tree, a fair grower though small; branches slender. Not of the finest quality for dessert, but excellent for preserving. Hang an the tree till October and its lateness of season should prevent any confusion with the common blue plum.

Shipper's Pride.—Under this name there are grown two distinct varieties. The one grown here is a vigorous upright tree, quite hardy and productive. Fruit large, roundish-oblong, dark blue with heavy blue bloom and distinct suture, ripening about August 20th. Flavor extremely poor, no good for dessert, or canning purposes.

The other variety in a large blue plum, more of the egg type, somewhat similar in shape to Grand Duke. At the Experimental Farm at Agassiz, B.C., the Shipper's Pride, is identical with the one grown at this station. Specimens of both varieties were sent by me to Messrs. Elwanger and Barry, but were unfortunately lost in transit. Mr. S. D. Willard was inclined to think the one grown here was correctly named, and the Michigan Station reports a similar plum as the Shipper's Pride. The attempt to settle finally the identity of varieties can, I think, be made an important part of our work.

Prince of Wales.—An old variety of English origin, little known, but now receiving a fuller recognition of its merits. It is a free stone plum of good quality, a heavy bearer and vigorous grower; quite hardy here.

Goliath.—This is a fine, large, reddish blue plum, ripening if anything a little ahead of Lombard; fairly productive and hardy and of good quality, especially for canning.

St. Catherine.—An old and well-known French variety, not grown here as much as it should be. A handsome yellow plum, marbled with red, excellent flavor, moderately vigorous and productive.

CHERRIES. Through the whole of this district cherries were this season a remarkably full and clean crop. Of the sweet or Heart type, Knight's Early Black did best here, one tree yielding 180 quarts of fine fruit. Among the Morellos, Early Richmond, and Montmorency, have proved most profitable. Montmorency ripens directly the Early Richmond is finished. It is a vigorous grower with compact bushy head, quite unlike the open spreading character of the Richmond. It should be kept well thinned out in the centre when young. The fruit is a shade larger than Richmond, and is a fine firm cherry. Of cherries, of the Duke type, which in character come half way between the Morellos and the Hearts, May Duke ranks easily first. It is a fine juicy melting and slightly acid cherry; an excellent canner, and, when fully ripe, a rich and luscious fruit for dessert purposes. Ripens here last of June. The tree is a particularly upright grower. The fruit forms in clusters, and has a good quality of parting very easily from the branches. It has proved with me a good and regular cropper.

NOTES ON INJURIOUS INSECTS.

The Peach-tree borer (*Ægeria Exitiosa*).—This pest, the larva of a slender day-flying moth, does far more damage through the peach orchards of the country than most growers suspect. I find, that, where they are searched for at all the usual practice is to cut them out with a knife, but I believe the application of a wash to the tree to be the better plan. The moth, as most fruit-growers are aware, will lay eggs anytime from June till October, the grub usually passes the winter in the tree in its larval state, emerging into the moth condition again in the following summer. The egg is usually laid at the base of the tree, the young larva immediately gnawing its way to the inner bark upon which it lives, its presence later on being indicated by gummy castings. I have used air slacked lime with success, heaping it around the tree in spring, and removing it for the purposes of examination in the fall, but I believe a wash to be the desirable method. It is far better to prevent the moth laying the eggs than to hunt for its destructive progeny afterwards. A thick whitewash with enough carbolic acid to give it a strong scent is usually effective. If ashes are mixed with the wash it is likely to stay on the tree somewhat longer; or one pound of common hard soap with two gallons of water, heated to boiling, and add afterwards half a pint of crude carbolic acid. I hope to test systematically next season the various remedies, and report as to both effectiveness and cheapness.

The Black Peach Aphis (*Aphis Persicæ niger*)—This insect, sometimes called the peach root-aphis, is one of the numerous family of plant-lice, and in its underground form is a difficult foe to fight. I have observed the injurious effects of its attacks on young peach trees during the past season. The growth of the affected trees was very poor, and the foliage looked sickly and yellow. The shiny black aphides were found clustered on the young rootlets upon the juices of which they feed, thus utterly preventing the development of a healthy root system. The case is doubtless often diagnosed inaccurately as Peach Yellows Refuse tobacco dug in around the tree has been found successful, but Prof. J. B. Smith, of New Jersey, who has studied the matter closely, advises an application of Kainit. Kainit has the additional value of being a good fertilizer for the peach. It usually contains from ten to twelve per cent. of pure potash and about thirty-five per cent. of common salt. Apply to the tree directly trouble is suspected. Spread it round about as far as the roots reach. Put on before a rain if possible; the solution will kill the aphides by contact, and the tree will take up the fertilizing elements. About two pounds should be enough for a newly planted tree, increasing the application to ten pounds for a tree in full bearing.

The Peach Bark-borer (*Phœoribus liminaris*).—A small beetle about a twelfth of inch long is responsible for much serious damage to peach trees. As yet it has not spread to any great extent, but where it does occur immense injury is done. I have observed a great deal of its work in Niagara township, and some in this neighborhood. The beetles bore their way into the bark all up the trunk, and the small grubs pass their life in the bark, emerging in due course as beetles.

The trouble is easily detected in the earlier stages by the red powder cast out as the beetles bore. Later on immense quantities of gum ooze from the infested trees, as much as a gallon in bad cases. When a tree is very badly attacked, I believe it would be advisable to take it out and burn at once, thus preventing the spread of the pests. If the tree, however, is taken in time, it can be saved. Dr. Fletcher reports very fully on this insect in the Experimental Farm Reports for 1894 and 1895. At Queenston, where the evil has been most serious, the following wash has been found successful:—5 pounds of washing soda, 3 quarts soft soap; add enough water to make about 6 gallons; put in enough air-slaked lime to make the mixture thick, and to this add 2 table spoonfuls of Paris green and 1 ounce of crude carbolic acid. Apply with a whitewash brush, thoroughly covering the trunk and the lower part of the main limbs.

The Plum Curculio (*Conotrachelus nenuphar*).—Description is unnecessary, as this beetle is well known. I have tried most of the remedies advocated, but consider spraying and "jarring" the only effective methods. Next to these I have found dusting with air-slaked lime the most valuable. Many leading entomologists believe that jarring is the only sure remedy. This season I tested both methods, and, while I found that from a carefully sprayed tree a few curculios could subsequently be jarred, yet results were equally satisfactory. Prof. Wild, in his valuable little book, "Insects and Insecticides," says the curculio eats foliage and blossom and gnaws the plum to satisfy its hunger. My impression is that it lives entirely on the leaf. I have observed it feeding, but think it more than likely that the poison is some time in taking effect. Jarring, while comparatively easy with young trees, is both more difficult and less satisfactory with larger ones. If spraying is equally effective, and I believe it is, the latter process should be adopted, as by combining the Paris green with Bordeaux mixture fungus diseases can be fought at the same time. The larva of the curculio usually leave the fruit a little while after it has fallen, and burrowing into the soil, change into the pupa state, emerging in a few weeks as mature beetles. Those entering the soil later on pass the winter as pupa, and come out beetles early next spring. As a single female beetle can lay from 150 to 200 eggs, it is highly important to pick up and destroy all fallen fruit, and thus cut short the next generation of beetles.

The Pear Slug (*Selandria cerasi*) is another familiar pest, but the damage done this year exceeds anything within my recollection, and shows that growers are not generally alive to the evil. The second brood in August did immense damage, the slugs working almost as freely on the plum as on the pear and cherry.

I usually spray with a solution of hellebore, one ounce to three gallons. Hellebore is a vegetable poison, killing both by contact and by being eaten. It is less dangerous to handle than Paris green, and in this case equally effective. Directly the slug appears spraying should be commenced. It is one of the easiest insects to control, but skeletonizes the leaf with great rapidity, and it is sure that thousands of trees will go into winter quarters this year with unripened wood and imperfectly developed buds, owing to the unchecked ravages of this noxious pest.

Other injurious insects, such as the Pear tree Psylla, Grape-vine Flea-beetle, Six-spotted Paria, etc., have not done sufficient injury to justify the giving up of more space. One great and growing evil must, however, be referred to, viz., "Peach Yellows." There is nothing new to say about this dread disease.

Dr. Erwin F. Smith, who has given years of study to the subject, has been unable to lay his finger on any definite cause and say "here is the trouble." But, while an exhaustive study, theoretically and practically, has been unable to discover the true nature of the disease, such study has amply shown that the axe and fire will prove effectual in preventing its spread. In common with many others, I have marked with growing concern the steady advance of the "yellows" in the Niagara Peninsula, and my firm conviction is that unless prompt and collective action is taken the orchards of the district will soon be decimated, and peach growing eventually be rendered unprofitable. The law in Ontario is perfectly adequate if enforced. Unfortunately, no man, however thorough in his methods, can wholly protect himself, as one infected orchard can spread the plague broadcast.

No expression of opinion, official or private, can be too strong or too frequently heard when the apathy of the municipalities is considered and the perfunctory way in which the law is carried out I trust, however, that we may see a vigorous movement in this matter before another year, and a steady abatement of the evil.

MARTIN BURRELL.

BURLINGTON STATION.

There are now under cultivation at this station 169 varieties of different classes of fruit, made up as follows :

Raspberries and blackberries	33	varieties.
Pears	25	"
Currants	17	"
Apples	22	"
Plums	42	"
Peaches	4	"
Grapes	26	"

RASPBERRIES AND BLACKBERRIES. The bushes planted in 1895 are doing well, and, as yet, are practically free of insects and fungi.

The Kansas, Columbian and Shaffer's Colossal promise well, and the Kittatimny passed through last winter unharmed by the cold, although it was not protected.

PEARS All the varieties planted last spring are living and have grown very well, the Wilder, Petite Marguerite, Josephine de Malines, Bosc, and Vermont Beauty being especially vigorous. The pear blight has done a great deal of damage to the older pears here this season, and appeared to strike two classes of trees, (1) those making a very strong growth of wood, (2) and those weakened by a heavy crop in 1895 The slug, too, did some injury, but was, in a measure, checked by spraying.

CURRANTS. Of the currants planted in 1895, the Cherry, Champion and Naples gave a few berries, the Champion averaging the highest.

APPLES. In this district, as elsewhere in the Province, the crop has been an enormous one, and I should say without precedent in this country. Wherever there were trees there appeared to be apples. For commercial purposes I consider the following the most profitable : Duchess, Ribston Pippin, King, Cranberry Pippin, Greening, Baldwin and Northern Spy. I doubt if any apple in this locality would stand the commercial test so well as the Baldwin.

The Wealthy and Ontario are almost new apples here and promise well.

The twig blight did considerable damage to the trees this season, especially to such varieties as the Greening, Holland Pippin, Ribston Pippin, Snow, Spitzenburg and Gravenstein. The younger orchards also suffered severely from the codling moth. The apple spot was not at all prevalent this year.

PLUMS. A tree of Ogon planted in 1892 has bloomed profusely for two years, but as yet no fruit has set.

All the trees planted are living and have made a satisfactory growth, the Pond's Seedling, Fellemburg and Burbank being very strong. By using Paris green and lime I prevented the second brood of the slug this season. Of the older trees the Lombard and Reine Claude were the only varieties that fruited to any great extent. The Reine Claude promises well for a late plum here, and as for quality, it is not excelled. I picked a few, that had been overlooked, from the trees on the 30th October and, save a slightly shrunken appearance, they were first class in quality. The Lombard, however, is the most profitable commercial plum here, up to the present time.

PEACHES. There were few, if any, here this year. The Alexanders and Crawfords are the chief varieties grown.

GRAPES. The Concord, Worden, Vergennes, Lindley and Moore's Diamond are the most profitable here. The Niagara is too tender, and to be successfully grown must be protected in the winter. Moore's Diamond is, so far, the most satisfactory white grape that I have. It is healthy, hardy, vigorous, productive and of good quality.

A. W. PEART.

SIMCOE SUB-STATION.

I have to report an almost total lack of fruit for 1896, which I attribute to deep cultivation at the critical time when the fruit was forming, causing it to drop.

I may add that my own experience extending over some years, and the experience of a number of others, leads me to conclude that mulching is preferable to cultivation in spring for both gooseberries and currants. It secures the necessary conditions of "damp and cool."

The Pearl has again shown its superiority over Downing in vigor, and where closely pruned and liberally fertilized is a fine berry.

The fruit of both Downing and Pearl were attacked by mildew this season, which is very unusual.

Champion made a great growth of wood, but the fruit mildewed badly for the first time. I do not think this berry all that is desirable either in size or quality, but it is a step in the right direction. The wild variety from which this berry originated is very vigorous, and perfectly free from mildew. It is of the same species as Houghton.

The White Crystal, another cross upon this wild variety, is a very promising variety, the young growth of wood and foliage not being seriously affected by mildew. I find the foliage of any variety affected in the same proportion as the fruit. The originator, J. H. Hynes, of Delphi, Ind., reports this variety to be a great bearer of very large berries.

Carnie's Yellow is fairly vigorous and seems, judging by foliage, to be able to resist mildew. The fruit sent me by Mr. Carnie, of Paris, was a fine size, twelve berries weighing $2\frac{3}{4}$ ozs. Phœnix, another berry sent by Mr. C., is very large, and the bush sent to the station is ahead of many others in freedom from mildew upon young wood and foliage.

A Champion, sent to the station by E. D. Smith, though it seems to be identical with Haynes' berry in wood, fruit and foliage, was entirely exempt from mildew in both fruit and foliage, the only berry so favored out of over 80 varieties except Haynes' wild.

Red Jacket, which held on to a few berries, has maintained its previous character. The berries were less affected by mildew than either Downing or Pearl. It is also as vigorous a grower as Pearl, if not more so. The fruit resembles Pearl somewhat in shape but is larger. Taken altogether this is one of the most promising berries we have, so far as we have been able to judge.

Success, Dominion and Oregon Jumbo have not been sufficiently tested to enable us to say much about them.

The fifty-two English varieties arrived in very bad condition, no doubt owing to the hot, dry weather in April and May. By a great deal of work, watering, etc., probably forty per cent. are alive. One variety, the Green Chisel, has not only survived but made quite a growth of new wood.

Whitesmith suffered severely last winter, the only variety at all affected. These bushes were well covered with snow the entire winter, and yet one-third of the wood was dead this spring—no fruit.

Crosby's Seedling is a very promising variety; vigorous with a good degree of immunity from mildew. No fruit yet.

Queen and Chautauqua, which resemble each other in foliage and general appearance of bush, suffered rather severely from mildew. No fruit this year.

Both Prolifics mildewed badly, but further testing is needed to form a correct judgment.

Crown Bob mildewed badly, as did Lancashire Lad.

Keepsake and Mrs. Whitiker seem to resist mildew better than Lancashire Lad, and Mrs. Whitiker especially made a good growth of wood. No fruit.

I may explain that spraying can hardly be made to protect the young growth of wood and leaves, as the tips will mildew in one night, and this year as fast as they grew. There has been on some varieties a succession of growths, the older growth rotting, and after a few weeks a new growth, which immediately mildewed in its turn.

STANLEY SPILLETT.

HALTON SUB-STATION.

STRAWBERRIES IN 1896.

The season of 1896 was one of the very best in the Guelph and Burlington sections, full crops and fair prices extended for a good month.

The drouth of 1896 was somewhat severe, so that only a thin stand of plants was made in many plantings, thus the plants had room to mature a full crop of fine size and good colored berries. One of the great mistakes made in a season when plants are freely made is that the grower allows too many plants to root, often a dozen plants occupy the ground that a single plant ought to have.

I am convinced from experience and close observation of many beds in the fruiting season, that if the grower would grow them so as to have the rows quite narrow, the rows could then be grown a little closer together, and so have more "edges," as I find the finest and best fruit is always picked from the edges of the rows; very few and only small berries being got from the middle of wide matted rows.

A grower will plant rows four feet apart and then think when he has got the plants to meet between the rows and standing a plant on almost every square inch of the ground, that he has a fine bed, and anticipates the crop of fruit he will obtain the coming season. I consider that in all such plantations a great mistake has been made; if he had cut off every runner after the rows were twelve or fourteen inches wide he would have a better crop in every way, and take in more money from the same ground because of the better price he would receive for the larger berries.

After sufficient plants are set, leaving paths eighteen inches to two feet wide which are for the pickers to move about in, then but few of the fine bunches of berries to be found on the edge of every row will be smashed or destroyed by the pickers. I am sure from my observation that a great deal of fine fruit on a row is destroyed by the pickers not having room to move about freely in; and be they as careful as they may in the very narrow paths that some leave, they will step on bunches. I have asked many pickers, "Where do you find the finest berries?" The reply invariably is, "On the outside of the row." "Where do you find the largest bunches?" "On the outside of the row." So I think if growers would let the strawberry plot go more to edges and less to centre they would get more and finer fruit on the same space of ground.

Strawberry plants are hardy, and it is not necessary to cover them to keep them from freezing, but on some soils, such as at Guelph, a covering is needed to prevent the frost heaving the plants out of the ground. A mulch is very useful in the summer time to protect the berries from becoming sanded after rain, and also to retain the moisture in the soil. Late fall or early winter is the best time to apply the covering, or it may be

put on in the early spring. We find pea straw the least objectionable, as it is freer than most straws from weed seeds. We have had the beds go into winter quarters free of weeds, so that the covering need only be removed from the plants to the paths in the spring and act as a mulch for the retention of moisture, and the keeping down of fresh weeds that might germinate in the spring.

The large majority of the varieties now before the public are only chance seedlings found in fence corners or on stone heaps, picked up by accident often or grown from seed taken by chance. A few have come from crossing well known sorts. Many originators have been satisfied to take seeds of some of the finest berries of some good kind; thus one parent only was known. Then again, some have taken great pains by fertilizing by hand under glass so as to know the parentage on both sides of all their seedlings. By far the most satisfactory results must surely be obtained by raising seedlings from crosses of the very best varieties.

One purpose in such work with us is to learn what varieties to make use of; which varieties are best suited to each other, and which varieties crossed produce the best results. No one can say what the result will be from fertilizing one variety with another, whether you use Woolverton x Haverland or Clyde x Timbrell. We are endeavoring to be exact in making the crosses, so that facts may be learned and better results secured.

What Kinds to Select.

This is of great importance, and one of no small difficulty. First of all the planter must determine just what he wants in a variety, and then select the one that in that particular is most widely successful, that come nearest his standard. There are varieties that are successful on most soils, and do well everywhere, while there are others that seem to require some particular soil to do their best. By taking no notice of the extravagant descriptions of originators or introducers and dealers, and trying in a small way, either by a dozen or 100 plants, those that are reported upon most widely as doing well, after one or two years' trial, a grower would surely soon determine for himself what variety is most suitable for him to grow.

A list of the varieties that succeed under widely different conditions would be a short one, but for the general grower, and certainly for the market grower, it would contain every one that it would be worth his while to try on his soil. Every one must test for himself, for no one else can tell just what varieties will best suit his soil and produce the best results for him; but it does not follow from this that the results of others' testing are of no worth to him. For instance, the fact that such a variety fails or has a weakness in one place shows that it is very likely to do so when grown in another soil. Keeping this before us one can very easily decide what kinds not to test.

The fact of the sexuality of strawberries is a well known one. The right proportion of perfect and imperfect flowered sorts to plant has not been settled and is still an open question. The season has a good deal to do with the proper fertilizing of the imperfect sorts. In a season when at the time of blooming if it is dry and sunshiny and somewhat windy, one-sixth or one-seventh of perfect flowering kinds would be sufficient, but if the blooming time should be cold, cloudy and wet the imperfect flowering sorts would not be perfectly fertilized if every other row was a perfect bloomer. It is best to plant the varieties together that bloom at the same time, that are same color and size.

It has been generally conceded that those having imperfect flowers are the most productive, but we are having some very fine perfect flowering kinds put before the public, viz., Clyde and Tenessee Prolific. These, from recent reports, are as productive as any of the imperfect flowering kinds.

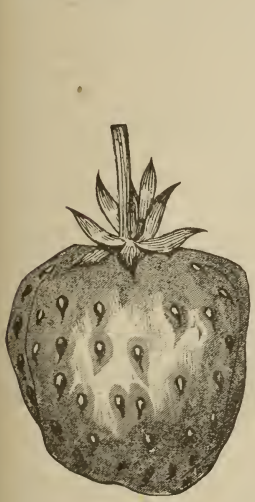
As for this year's crop it was a good one, all the standards doing their best. Any kind that could not give a fair crop under the favorable conditions of the past season could not do so under any conditions. In my opinion it was a very good season for testing the various kinds, and so would be a fair trial season. The soil here is a sandy loam, enriched with horse and pig manure put on in the fall.

I am able to say that Bubach and Haverland with us have kept their place among the leaders. Some few have gone ahead and taken a front place, notably among these have been the Clyde, now widely tested, and the Ruby not yet introduced.

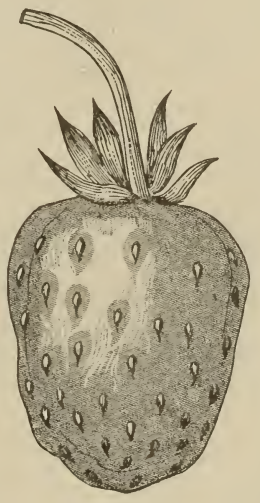
Description of Varieties.

Aroma, (S.)—A seedling of Cumberland, grown by E. W. Cruse, of Kansas. Plant very healthy; large, strong plant; good grower. Friut, fine dark red in color, large and firm good quality and quite productive. A good one to fertilize large pistillates with. In bloom May 18th. Ripe June 11th. A good one to grow.

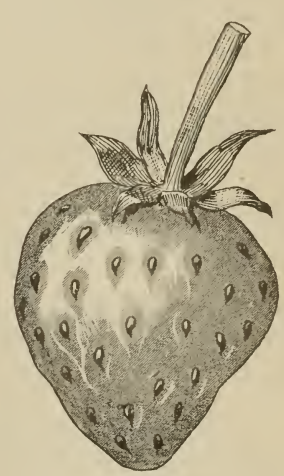
Bubach, (P.)—This originated in Illinois. The plant is magnificent; a strong and long rooted one. Dark, rich foliage; no sign of disease of any kind. Makes plants enough for a good fruiting row. The fruit stock is short, but strong and firm. The fruit is wonderful for its size and color. The berry is very showy, its bright color taking the eye. We call it very productive and profitable. The flesh is pink inside, quality good; medium in firmness. It succeeds well everywhere. In bloom May 7th. Picking June 6th. One of best.



Berlin.



Glen Mary.



Margaret.

Brandywine, (S) This variety originated in Pennsylvania. It is one of the most vigorous of growers, making a wide matted row, if allowed to do so. The plant is healthy and strong and dark foliage. It is supposed to be a seedling of Glendale and Cumberland, and the fruit is of large size, heart shaped, a fine dark scarlet in color, firm and of good quality. The plant succeeds in most soils. In bloom May 21st; first picking June 14th. Its one great fault is that it does not produce enough.

Bisel, (P.) This comes from Illinois, originated by D. Bisel from the Wilson. A good grower, making plenty of plants for wide row; shows some rust. Fruit a good bright red in color. Very productive and quite firm, a good market sort; said to be in great demand in the Chicago market. In bloom May 20th; first picking June 13th. A good one.

Berlin, (P.) This is from Maryland, originated by J. Harrison from seed of Bubach. The plant is a good grower, makes a good row. It is much like its parent. The fruit is not as large, nor is it on the whole any improvement. In bloom May 9th; first picking June 6th. Not as good a variety as the Bubach.

Banquet, (S.) A supposed cross with the wild strawberry. The plant only medium in vigor; fruit of fine quality, medium in size and not a great deal of it. In bloom May 18; ripe June 13th.

Brunette, (S,) Comes from Indiana. The same may be said as of Banquet ; fruit of fine quality, but not enough of it. In bloom May 16th ; ripe June 13th.

Bouncer, (S.) A seedling of Jersey Queen and Miner, from Conn., sent out by J. Hall, paying $50 for the most suitable name for it. It is only a medium sort with me. After one year's fruiting will give it another trial. In bloom May 18th ; first picking June 13th.

Carrie, (P.) A seedling of Haverland, by Mr. Thompson of Virginia. It is a strong grower, making very long runners and plenty of them. It is much like Haverland. The fruit is firmer and of better color. In bloom May 18th ; first picking June 9th.

Cyclone, (S.) A seedling of Crescent and Cumberland, from Kansas by E. W. Cruse. The plant is a vigorous grower and very healthy, making lots of runners ; blooms early ; among the first this year in bloom (May 6th) ; first ripe June 6th. Set an immense crop this year, and good size, conical, firm. Very rich in pollen. A good fertilizer for early pistillates. A bright scarlet in color and of good quality.

Clyde, (S.) This is a seedling of the Cyclone, grown by Dr. Stayman of Kansas, and sent me some four years ago. The first berries were as large as Bubach and the plant as productive as Haverland or Crescent, and the berry very much firmer than either. In fact the Clyde is one of the finest of berries. It is what I call a second early, coming in just after Michel's or Van Dieman. The plant is perfect in every respect, and is one of the most healthy, no sign of rust or disease about it. Strong and long roots. It grows very much like its parent, but very much stronger. It also resembles the Haverland, but its fruit stalks are not so long and are very much stronger, and so are able to hold up its fruit. In fact it has a perfect fruit stalk, strong and just the right length and not too short like the Bubach. The plant in color is very much like Cyclone and Haverland. The fruit is a good scarlet. In shape it is roundly conical. I have fruited it four years, and have tested it in dry seasons as well as the past favorable one ; and in my opinion it has come to stay, and will take a first place. It is a strong staminate, rich in pollen.

Della, K., (S.) A seedling of Sharpless by E. B. Stevenson, Ontario. The plant is one of the most vigorous growers, strong and healthy. The berry when grown on rich soil is one of the most beautiful that can be imagined. It is perfect in shape (see cut of it in *Horticulturist* for September, 1896) ; of finest color, good quality. We are giving it another test to decide productiveness. In bloom May 22nd ; ripe June 18th.

Eleanor, (S.) Chance seedling from New Jersey by Mr. Coombe. The plant is small and slender, but very healthy and vigorous, making many runners ; good rich color ; fruit heart shaped, regular in shape ; quite productive ; good quality and quite firm ; ripens its crop early, a good one. In bloom April 30th ; first picking May 29th. Worth trying by all growers.

Enormous, (P.) This comes from Illinois, grown by Mr. Curtis from seed of the Crescent. The plant is healthy and a good grower, quite productive, but the berries were quite irregular in shape. In bloom May 18th. Will give it another trial before I say much about it, but I am not very favorably impressed with it.

Greenville, (P.) Originated in Ohio. A chance seedling found by Mr. Benebly. This is a second Bubach, but a better grower and plant maker ; plant very healthy and vigorous. It is if anything more productive than Bubach, the berry about the same size, and same in firmness. It is a good one. No one can go wrong in planting Greenville. In bloom May 14th ; first picking June 9th.

Glen Mary, (S.) A chance seedling found by J. A. Ingram of Pennsylvania. The plant is a strong, healthy, vigorous grower. I should say it was very productive if I may judge from the few plants I had to fruit. In bloom May 16th ; first picking June 13th. Fruit of very large size and good quality ; crimson in color. I should say it was a good one ; will be better able to say after another year's fruiting.

Haverland, (P.) Originated in Ohio by Mr. Haverland ; parentage unknown. The plant is very healthy and is a vigorous grower, sending out strong runners. Its foliage is magnificent. The fruit stalk is very long and often not able to bear up the great load of fruit the plant matures. The fruit is large to very large, long ; bright scarlet ; medium in firmness ; flesh pinkish ; sweet and good quality and season. It is one of the first to ripen, and continues all through the season. It succeeds in all kinds of soil. In bloom May 6th ; first picking June 1st.

Howard's No. 501, (S). This was grown from seed of Jersey Queen fertilized with pollen from Wilson by A. B Howard, of Massachusetts. The plant is small, but very healthy and vigorous. I can speak very favorably of this kind from one year's fruiting. (Not for sale yet.)

Howard's No. 41, (P). This also was originated by Mr. Howard of Massachusetts. It is from Haverland crossed with Belmont ; a good strong grower ; fruit large, bright crimson in color, good quality. In bloom May 14th ; first picking June 12th. It is worth a trial. (Not yet offered to the public).

Jersey Queen (P). A good late variety ; in fact with me it is the latest. Fine healthy foliage, good grower. Fruit is large, round and bright scarlet in color and glossy bringing the highest price in the market. First picking this year June 15.

Kossuth, (S) Seedling of Warfield from Kansas. Plant rusts somewhat. In bloom May 10th, first picking June 3rd ; fruit large, flesh white, quite productive. Its greatest weakness is its rusting of the foliage.

Lord Sheffield, (S). This is a variety from England. Plant, a good grower, but has some rust. The fruit is good size, and of good shape and color, and quite productive. It is a good early kind. In bloom May 8th, first picking June 6th.

Longfield, (P). This was grown by Dr. Stayman from seed of Warfield. It is a vigorous grower, making wide row. The plant is healthy and productive. Size of berry medium to large. and quite firm. It is regular in shape and of a rich, dark color. A good market sort. In bloom May 20th ; first picking June 6th.

Michel's Early, (S). A fine grower, making far too many plants. In bloom May 1st, first ripe, May 30th. I never saw the Michel's do better than this year. Set a very fair crop of good sized berries, which with the good prices they sold for made this variety a profitable one this year.

Margaret, (P). This was grown from seed of the Crawford by Mr. Beaver, of Ohio, and not by Mr. Crawford, as previously stated. A very large, strong plant sending out the largest runners of any sort ; plant healthy ; fruit is large, regular ; crimson in color ; quite productive ; of good quality. In bloom May 12th, first picking June 8th. A good one, being offered for sale in spring of 1897.

Marshall, (S). From Massachusetts. The plant is large, stools somewhat, does not send runners out freely unless it is petted, and in very rich ground ; rusts somewhat, sometimes badly. The fruit is of the largest, dark red ; good shape, and of best quality, but not very productive. A good sort for amateurs to grow show-berries from, but not of much use for market growers.

Rio, (S). Seedling of Sharpless, from Virginia. Plant is a good grower, making many runners. In bloom May 18th, first picking June 6th. Fruit firm, good quality ; flesh red, stem short. Bright scarlet ; good productive. Worth a trial.

Ruby, (S). The Ruby originated by Mr. Riehl, of Illinois. It is a grand plant, being a fine grower and healthy, with fine large fruit and a good lot of it ; of very good quality. Well worth a trial by everybody. The fruit is as large as Bubach, and is more regular in shape (roundly conical) ; it is darker in color and red flesh all through ; roundly conical. I think it will take a place among the first. A staminate or perfect flowering kind.

Saunders, (S). Grown by Mr. Little of Ontario. One of the best market sorts. The plant is a good vigorous grower, making many plants, and healthy. The fruit is

large and fine, color bright crimson and of best quality, ripening evenly. It blooms late, and thus often escapes the spring frosts, but it ripens in mid season; it is very productive. It is not so well known as the Williams, but in my opinion it is far better in every respect. It is a very firm berry, and I would advise market growers to try it.

Smith's Seedling, (S). Plant, a rampant grower. The plant is very healthy, making many runners. In bloom May 3rd, ripe June 2nd; very productive for an early one; fruit large; flesh white. Seeds depressed scarlet in color; quality fair; medium in firmness.

Staples, (S). A seedling of Warfield from Ohio, by Mr. Staples. Plant quite healthy, making plenty of runners; quite vigorous, fruit dark crimson, flesh pink, firm and good flavor. Color very like Warfield, and can be picked in same basket. A good one to fertilize Warfield with or any other early pistillate. In bloom May 8th; ripe June 1st. A good one.

Stone's Early, (P). Comes from Illinois; grown by C. C. Stone. It is a seedling of the Crescent. The plant is healthy and a good grower. The fruit is a bright scarlet, conical in shape, but small in size. It is quite productive. The berry is soft but of good quality. There are other early kinds very much better. In bloom May 6th; first picking June 5th.

Tennessee Prolific, (S). A seedling from Crescent crossed with Sharpless from Tennessee. The plant is a healthy vigorous grower, and very productive, taking after the parent Crescent in this respect. The fruit is large and of good quality. It is bright scarlet in color; one of the best market berries. In bloom May 12th; first picking June 9th.

Timbrell, (P). Chance seedling from New York by H. S. Timbrell. The plant is strong and healthy, a good grower and very productive. Size medium to large, of the very best quality. The color does not please some, but if plenty of potash is in the soil there will be no trouble with the color. I am pleased with the Timbrell. In bloom May 11th; first picking June 10th, and continued right through for a month.

Van Dieman, (S). From Arkansas grown by J. C. Bauer from seed of Crescent crossed with Capt. Jack. A good vigorous grower. Some rust. Fruit bright crimson in color, very attractive and very firm, and of the best quality; also large in size one of the best extra earlies, being quite productive. In bloom May 5th; first picking May 30th.

Vera, (P). Chance seedling from Guelph, by Mr. Stevenson. Plant very strong and a very healthy grower and vigorous, making a very wide row. In bloom May 14th; first picking June 5th. Fruit stalk short; flesh pink, firm and of good quality. Quite productive.

Warfield, (P). Supposed cross from Crescent and Wilson from Illinois. Plant is a healthy vigorous grower. Small and slender but very vigorous, making almost too many runners; foliage healthy and of dark color. Its fruit stalk is medium; plant is *very productive* of rich dark colored fruit and quite firm. Size of fruit medium to large, all perfect in shape and very regular. It is a good shipper. Quality fair; acid, flesh red, white centre, one of the best market sorts. One of its faults is it can not stand a hot dry season. In bloom May 6th; first picking June 1st.

Wm. Belt (S.) Comes from Ohio, grown by Wm. Belt. The plant is a large and strong one, but rusts every year, sometimes badly. The plant is quite productive of berries of the largest size but not the most regular, but bright color and handsome and of best quality, it will prove I think valuable. In bloom, May 14th; first picking, June 12th; worth a trial.

Williams (S.) Seedling of Sharpless, by Mr. Williams, Ontario, plant very vigorous, short runners; some rust; quite productive, fruit does not ripen evenly. It resembles its parent in this respect; conical in shape, with white rose; large in size; fair in quality, not as good as Saunders or Tennessee Prolific. In bloom, May 24th; first picking, June 14th.

Woolverton (S.) Grown by John Little, Ontario. Plant strong and large; quite healthy, stands dry weather with the best. An early bloomer, but season of fruit is late. The fruit is large and fine looking, of good quality and quite firm for a large berry. Color, dark crimson, but the flesh is white; one of the best fertilizers. In bloom, May 8th; first picking, June 9th.

I have given the time of bloom, as I find mistakes have been made by growers not knowing the time of bloom of the varieties they planted. For instance, I found last season a grower who was trying to fertilize the Haverland with the Williams. He said he was told by the nurseryman from whom the plants were obtained, that the Williams would fertilize the Haverland. Now just look at the time of bloom of the Haverland the past season and of the Williams The Haverland was in bloom May 6th, and ripe June 1st, and the Williams in bloom May 24th. There were some of the Haverland almost ripe before the first blossom of the Williams was open, and all the Haverland fruit was set before Williams was in bloom. How was it possible, then, that the Williams could fertilize the Haverland? If this grower of whom I speak had not had some Michel's Early growing near his Haverland, the result would have been that the justly lauded Haverland would have been a failure with him; but as it was the Michel's accomplished for him what the Williams could never do. No doubt from such causes, *i.e.*, the mismating of varieties, have arisen many of the failures in securing a full crop of strawberries in the past.

I would like to tell you of an experiment I made the past season with unleached hardwood ashes; most of the ashes were made from hard maple. In July and August, 1895, I set out a patch with potted plants. I planted some eighty varieties, the ground was poor, being partly made up of builders' sand and the material dug from a cellar and the refuse after masons and plasterers were through with a building, this was spread over the ground some years ago. It was what I considered very poor soil for a strawberry bed. I planted it, and after frost came on I covered the whole alike with fresh horse manure quite thick, then at different times I applied the ashes.

I set the plot off in three portions, Nos. 1, 2 and 3. On No. 1 I put no ashes; on No. 2 I gave a fair share; but on No. 3 I placed a heavy coat, putting it on at four or five different times; I gave 3 a good dressing just after the frost was out of the ground, I put the ashes on the manure mulch and let the rain and melting snow wash it down to the roots The results were:—

On No. 1 the plants made very little growth, few or no runners, and are not making many now (the middle of July, 1896.) There is not much fruit, and it is a poor quality.

On No. 2, the plants made a very perceptible better growth, and had more runners and considerably more fruit, of a larger and better quality.

On No. 3 (where I put so much ashes that if there had not been lots of rain, which kept the ground moist, the plants would have burned up I believe), the plants made a wonderful growth, rich in color, glossy and healthy; very many runners thick as a lead pencil, and the fruit was magnificent, some of the finest I ever saw in color and firmness.

The results of the above experiment was very interesting to me. I found that on even poor ground, by a coating of manure as a mulch for winter protection, and a plentiful supply of unleached ashes and lots of rain, or by irrigation, you may have a magnificent crop of high colored and firm berries. On plot No. 3 the plants matured and ripened every berry set, continuing for nearly six weeks in bearing. The Timbrell was grand in plot No 3. There was no trouble about its color then, and the quality was the finest. My wife said it was the finest strawberry she had ever tasted. The aroma also was grand, the finest I ever saw it. It would take a good many ashes to feed a large piece of ground as much as I gave to plot No. 3.

I had several very fine seedlings of which Della K. is one. I have two or three very fine ones of Bubach crossed with Clyde, also Mary crossed with Clyde and two Clyde seedlings. These were picked out of some 400 or 500 that fruited this season for the first time.

Seedlings from Timbrell seed crossed with Marshall and Brandywine.

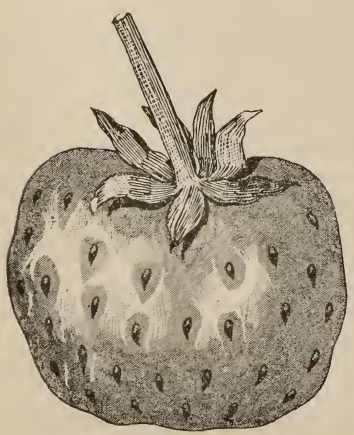
Timb No. 15 (S.) Grown from seed of Timbrell crossed with Marshall and Brandywine, by E. B. Stevenson, Ontario. Plant large, wealthy and vigorous; fruit is conical in shape, crimson in color, with golden seeds, making a beautiful appearance. Flesh pink, and of good quality and large size, one specimen was 6½ inches round. The cut is the actual size and shape of the berry taken from the plant. In bloom, May 13th; first picking, June 13th.

TIMB NO. 10.

TIMB NO. 15.

Timb No. 16 (P) Grown from same seed as above. The plant is a good healthy strong grower, fine dark color. The fruit is of fine appearance and very large. Crimson in color with golden seeds, and pink flesh. Fine sub-acid flavor, a fine seedling. In bloom, May 13th; first picking, June 13th.

Timb No. 10 (P.) From same seed as No. 15. Plant is a strong, healthy grower, and quite vigorous. The fruit is a beautiful dark red, keeping its color clear to the center



TIMB NO. 16.

TIMB NO. 18

of the berry. Very firm ; good quality ; quite sweet ; conical in shape. In bloom, May 10th ; first picking, June 8th.

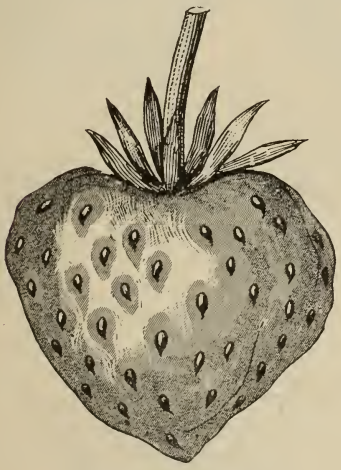
Timb No. 18 (P.) The plant is a large, strong healthy grower, looks very much like its patent Timbrell. The fruit is very large, round, and crimson in color, with golden seeds. Flesh white in centre, firm, and of good flavor. In bloom, May 13th ; ripe, June 13th ; a fine berry.

Timb No. 22 (P.) One of the best. The plant is perfect, strong, healthy and a vigorous grower, sending up a strong fruit stalk. The fruit is crimson in color, with red flesh, solid and good quality, and very large ; fine large bunch of fruit. In bloom 17th ; ripe, June 18th. This would appear to take after the Timbrell in lateness ; a good one.

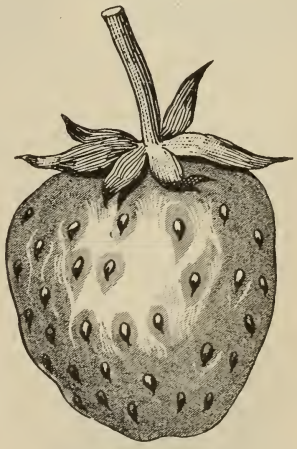
TIMB NO. 22.

Seedlings from seed of Howard's No. 41, crossed with Marshall and Brandywine.

Howard's 41—"*No. 25*" (S.) Grown from seed of Howard's 41, fertilized by Marshall and Brandywine. The plant is healthy and a good grower. These seedlings are vigorous growers, which, no doubt, they get from Brandywine or further off from Haverland through Howard's 41. The fruit is crimson, with gold seeds ; flesh bright red, and of very good flavor and firm, a fine berry with a slight neck. In bloom, May 14th ; ripe, June 13th.



HOWARD NO. 22.



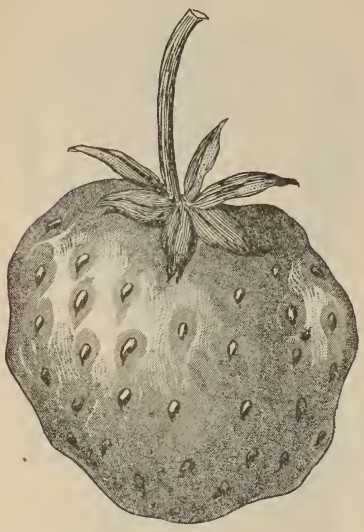
HOWARD NO. 25.

Howard's 41—"*No. 22*" (P.) From same seed as No. 25 above. This is a very healthy plant, fine vigorous grower. The berry is bright crimson, with gold seeds, making a fine appearance. Flesh red, firm and good quality. Has a beautiful green calix, and is a handsome berry. In bloom, May 13th ; ripe, June 13th.

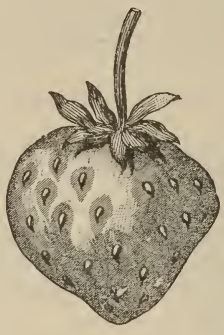
SEEDLINGS OF MARSHALL SEED.

Marshall No. 40.—(S) From seed of Marshall, by E. B. Stevenson. The plant is large, strong and very healthy. The foliage is the largest and the vines the strongest of any kind I know of. The fruit is large and of delicious flavor when fully ripe. It is firm almost as an apple ; deep red in the centre—a beautiful berry. In bloom May 8th; ripe June 9th.

Marshall No. 41.—(S) From Marshall. The plant is a good grower, strong and healthy. The fruit, sweet and nice tasting, quite white in the center, with fine color outside. A very nice berry to handle. Very productive. In bloom May 8th; ripe June 6th. I should say this will be a good market one.



MARSHALL No. 40.



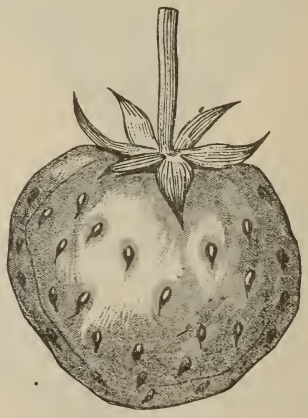
MARSHALL No. 41.

MARSHALL No. 42.

Marshall No. 42.—(S) From same seed as above. The plant is a fine one, strong and healthy. The fruit is of the finest color, delicious tasting and firm, clear to the center. Roundly conical in shape. A very fine berry. In bloom May 7th; ripe June 6th.

Marshall No. 43.—(S) From seed of Marshall. Plant, a fine, healthy, strong grower. Fruit, crimson in color, fine quality and quite firm. A strong, good fruit. In bloom May 12th; ripe June 7th.

MARSHALL No. 43.

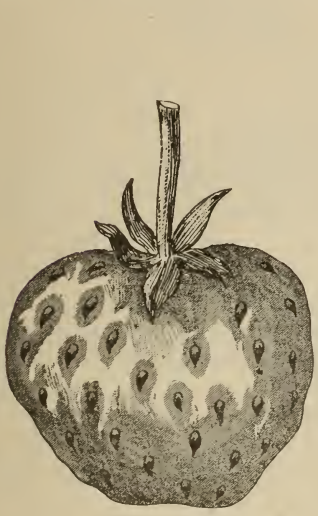


MARSHALL No. 49.

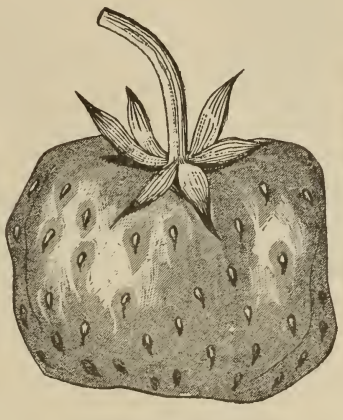
Marshall No. 49—(S) From seed of Marshall. The plant is healthy and a good grower. Fruit a good crimson, pale pink in center, firm and good quality. In bloom May 12th; ripe June 11th. A fine berry.

Stevenson No. 2.—(S) Grown from mixed seed by E. B. Stevenson. The plant is very healthy, a strong vigorous grower. The fruit is bright red, white in the center, quite firm, not overly sweet but pleasant to the taste. The berry is large and fine shape. In bloom May 7th ; ripe June 8th. It is very productive.

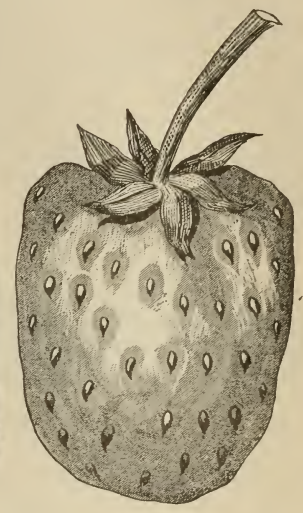
Stevenson No. 10—(P) From mixed seed, as above. The plant is healthy, a good grower, strong and vigorous. The fruit should be classed with the best. Lovely dark red in color, with golden seeds, fine quality and quite firm. In bloom May 7th ; ripe June 8th. A beautiful berry.



STEVENSON No. 2.



STEVENSON No. 10.



STEVENSON No. 65.

Stevenson No. 65.—(S) From mixed seed, as above. Plant healthy, strong grower and vigorous. The plant is light in color, a light yellow. The fruit is fine crimson, with gold seeds, oblong in shape, fine flavor, quite firm and very productive. In bloom May 18th ; ripe June 18th. It is a very late one, it would seem, from the first fruiting ; will have to wait for the second fruiting before we can decide on the point of productiveness. We have a nice patch of each of these seedlings to fruit in 1897. Will then be able to speak of their productiveness. I would like to write more, but must stop by giving a list of the best we had here the past season. It is as follows :

Clyde, Bubach, Ruby, Haverland, Greenville, Saunders, Tennessee, Prolific, Woolverton, Margaret, Carrie, Van Deman, Longfield. Following close after these were Rio, Bisel, Warfield, Lord Sheffield, Berlin, Mary, Cyclone, Beder Wood, Maple Bank, Brandywine and Edith. Glen Mary gives promise of great things.

I have the following to fruit another year before reporting on them :

Varieties	Sex.	Varieties.	Sex.	Varieties.	Sex.
Anery's Seedling	P	Columbia	S	Overholtzer's No. 4	P
Allen No. 13	P	Fountain	S	Pawnee	S
Beedis No. 2		Pet	S	Seedling Superb	S
" No. 1		Nebrings Gem	P	Seedling of Sharpless	
" No. 2		Overholtzer's No. 1	S	Thompson's 104	S
" No. 4		" No. 2	P	Yaboo	S

I have the following new ones to fruit in 1897 :

Varieties.	Sex.	Varieties.	Sex.	Varieties.	Sex.
Apache	S	Ideal	S	Slaymaker's No. 8	
Anna Kennedy	P	Jarabola	S P	Slaymaker's No. 10	
Annie Laurie	S	Lincoln	P	Satisfaction	S
Bismark	S	Mariedan		Seedling Cooper A	
Champion of England	S	Mytrotts		" B	
Evans		Naomi		" C	
Erie	S	No. 1,000		" E	
Glen Mary	S	Noble		Sunrise	
Hayden		Oriole	P	Tubbs	S
Hunn	P	Ocean City	S	Warfield No. 4	P
Holland	P	Premium	P	World's Champion	
Hull's No. 9		Ridgeway	S	Zula	S
Hull's No. 10		Sawlog	P	Michigan	S
Homestead		Sparta			

I have also a lot of Seedlings of the following crosses, made by hand under glass :— Crescent crossed with Marshall ; Princess crossed with Marshall ; Bubach crossed with Howera's 501 ; Mary crossed with Woolverton ; Bubach crossed with Woolverton, and Haverland crossed with Woolverton and Clyde.

E. B. Stevenson, Freeman, Ont.

CHERRIES.—STATION RECORD FOR 1896.

By L. Woolverton, Maplehurst, Grimsby.

Variety.	When planted.	Soil.	Cultivation.	1st and last cherries.	Yield in qts.	Average price per qt.	Remarks.
I. Sour Cherries.						cts.	
(*a*) *Kentish.*							
Early Richmond	1889	sandy loam	well cultiv'd	June 18-25			
Late Kenti h	1860						
Montmorency	1890	"		July 1-8			
(*b*) *Morellos.*							
Morello	1889	"	well cultiv'd				
Ostheim	1893	"	"	June 27—July 19			A fine cherry for the north.
Vladimir	1890	"	"				
Wragg	1893	"	"				
II. Sweet Cherries.							
(*a*) *Mazzards.*							
Black Mazzards	1860	"	"				
(*b*) *Hearts.*							
Black Eagle	1866	"		June 20-25	50	10	Best quality for dessert.
Black Tartarian	1866	"		June 19-28	250	12	Extraordinary yield in 1896.
Coe's Transparent	1866	"		June 16-20	100	8	Too soft.
Early Purple	1866	"	in grass	June 8-11	144	12-15	The earliest cherry.
Elton	1866	"	"				Best early cherry.
Governor Wood	1866	"	"	June 12-15	72	6-10	Delicious dessert cherry.
Knight's Early	1866	"	"	June 20-25	200	10	
(*c*) *Bigarreaus.*							
Mezel	1860	"	cultivated	June 25 30	180	12	Finest in size and general appearance for dessert.
Napoleon	1866	"		June 29	140		
Rockport	1866						
Yellow Spanish	1860	rich sandy lo'm	grass	June 26-30	360	8	Extraordinary yield in 1896; no rot.
Windsor	1893	"		July 1-10.			

Note.—Cherry orchard sprayed May 5th, Bordeaux; May 19th, Bordeaux and Paris green.

CHERRIES.

TESTED BY L. WOOLVERTON,

HABIT—S., Spreading; U., Upright; D., Drooping; R., Round; F., Fastigiate. SIZE—S., Small; M., Medium. SUTURE—L., Large; D., Distinct; T., Traceable; Ob, Obscure; Yellow; Yh., Yellowish; d., Dark; b., Bright; Pa., Pale; M.,

Variety.	Origin.	TREE.					FRUIT.			
		Habit.	Vig., scale 1-10	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Age of bearing	Size.	Form.	Skin—color.	Cavity.
I. PRUNUS CERASUS	(SOUR CHERRY CLASS)..	.....	..	....	....	....	...	.....	....	.....
(*a*) *Kentish*	(*Pale red, with uncolored juice*).	.....	..	....	....	....	.....	.....	.....	.....
*Early Richmond.	(Kentish, Pie Cherry, Montmorency) an old European sort.	R., S.	4	10	6	5	S to M	R	b. to d. R ..	M
†Late Kentish....	(Common Red, Pie Cherry, Common sort).	R,, S.	4	10	4	4	S to M	R. flattened.	b. R	M
*Montmorency (large).	Montmorency, France.	R , S.	6	10	8	5	M to L	R , slightly flattened at base.	b. to d. r. R.	M D
(*b*) *Morellos*	(*Dark red fruits, with dark colored juice*).	.....	..	....	....	....	.....	.....	.....	.....
Morello	(English Morello)	.....	..	....	....	..	.....	.....	....	.....
‡Ostheim...	Russia	Bush form	4	10	7	....	S to M	R. ob	R. to d R ..	.....
§Vladimir	.....	.....	3	10	3	....	S	R.....	d. P. to B.	R S
Wragg.	Wragg & Sons, Waukee, Iowa.	S.	3	10	8	2	M	R.....	b. R. to d. R at matur'y	M
II. PRUNUS AVIUM	(SWEET CHERRY GROUP)	.....	..	....	....	....	...	....	.....	.....
(*a*) *Mazzards* ..	*European seedling cherries, of vigorous habit*).	.....	..	....	....	....	.....	....	.....	.. ..
**Black Mazzard (wild English).	Europe — especially France and England. The parent of our heart cherries.	U.	10	10	4	....	S	R. H.....	B	S
(*b*) *Hearts*	(*With soft fleshed heart shaped fruit*).	.....	..	...	....	....	...	....	.....	.....
Black Eagle	....	.....	..	....	5	....	.....	.....	....	.....
Black Tartarian ..	.....	.....	..	..	8	....	.....	.....	.....	.....
††Cce's Tr'nspar'nt	.....	R., S.	10	10	5	....	M	R. regular .	b. shining A. nearly covered with b. cornelian R., with peculiar m. blotches.	M wide
‡‡Early Purple ...	(Early purple Guigne), Europe.	U., S.	8	10	7	late	M	R., acute H.	d. R. to P.	S

* Growing in favor for culinary purposes.
† Subject to curculio.
‡ Very desirable for northern sections.
§ No use.

CHERRIES.

MAPLEHURST, GRIMSBY, ONT.

M., Medium; L., Large; V. Very. CAVITY—S. Shallow; N., Narrow; D., Deep; B., Broad; Obs., Obsolete. COLOR—A., Amber; P., Purple; R., Red; B., Black; Y., Mottled. FORM—R., Round; H., Heart shape; Obs., Obscure.

FRUIT.							Qu'lity. Sc'le 1-10		Val. Sc'le 1-10.	
Stem—inches.	Suture.	Stone.	Flesh. Color.	Flesh. Texture.	Flesh. Flavor.	Season of use.	Dessert.	Cooking.	Home market.	Distant market.
.....	.....	....	.....	.....	.....	.....	..	..	....	....
.....	.....	.....	.....	.....	.....	.....	..	..	..	..
1.....	none	....	Yh	soft, very juicy	sprightly, tart ..	In 1896, June 20 to June 30 or July 1.	3	9	7	7
.....	.....	....	.....	tender, juicy .	very acid	July 1 to 10	2	7	6	6
1¼ to 1½, stout.	none	.. ..	Yh	soft, very juicy	sprightly, tart, milder when very ripe	July 1 to 10	3	9	7	7
....	.....	.....	.....	.....	....	.....	..	..	..	..
.....	.....	.....	.....	....	....	.....	..	..	..	..
1½ to 1¾ in ones and twos on previous years wood	none	S	d r. cling ..	tender, juicy, melting.	almost sweet when ripe—agreeable.	July 8 to 15	4	8	7	7
1⅜ scattered.	.....	S	p. dark co'or'd juice	melting, juicy.	sub-acid, fair ...	July 6 to 10	..	3	2	2
1¾ in twos and threes.	.....	.....	.....	.....	.....	July 8 to 16	..	..	..	..
.....	.....	.....	.....	.....	.....	.....	..	..	..	..
.....	.....	.....	.....	.....	....	. ...	..	..	..	..
long and slender.	.....	... .	.....	....	.....	July 1 to 10, in 1896.	..	2	2	..
.....	....	.....	.....	.....	.....	.....	..	..	..	..
.....	.....	.. ...	.....	....	.....	.....	..	..	..	..
.....	...	.....	....	....	.....	....	..	..	..	..
1½.....	obs.	.....	very pale yellowish tint.	soft, juicy....	sweet, excellent.	June 15 to 20	7	6	6	2
long, 2	obs.	.....	R. to P	tender, juicy .	sweet, pleasant .	June 10 to 15.....	8	2	8	8

** Some seedlings are large and fine and the fruit is marketable.
†† Too tender for shipment.
‡‡ Much eaten by birds; profitable on old trees if allowed to ripen fully.

CHERRIES.—*Continued.*

Variety.	Origin.	Tree.					Fruit.			
		Habit.	Vig., scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Age of bearing.	Size.	Form.	Skin—color.	Cavity.
Elton										
*Governor Wood	Prof. Kirtland, Cleveland, O.	R reg.	8	10	9	3—4	M to L	Obs. H	Light Y., marbl'd and shaded with light to d. R	B
Knight's Early										
(c) *Bigarreau's*	(*Hard fleshed, mostly light colored, and heart shaped*).									
†Mezel	(Bigarreau of Mezel), Europe.	W., S.	10	10	9		V L	Ob. H. une'n	d. R. to B.	M D
‡Napoleon		U., S.	9	10	10		L to V L	Ob. H	A., blotched and suffus'd with d. R.	B D
Rockport										
Windsor										
§Yellow Spanish Bigarreau).	Europe to America in 1800.	Low head.	10	10	6		L to V L	R. Obl. H. flattened at base.	Clear waxen A., nearly cov'r'd with R. on sunny side.	M B
Dukes	(*Tree of upright vigorous growth, fruit mostly acid or subacid*).	U. S.								
Hortense										
Late Duke										
**May Duke		UFD.	9	10	6		M	R. Ob. H.	b. s. R. to d. R.	M

* Best early dessert cherry.
† Finest and most showy.
‡ Subject to rot in wet seasons; perfect in 1896.
NOTE.—*Hardiness* in the above table refers to the Niagara District only. North of Toronto these sweet cherries are not hardy.

CHERRIES.—*Continued.*

Fruit.							Qu'l-ity. Sc'le 1-10.		Val. Sc'le 1-10.	
Stem—inches.	Suture.	Stone.	Flesh. Color.	Flesh. Texture.	Flesh. Flavor.	Season of use.	Dessert.	Cooking.	Home market.	Distant market.
.....	.....	.....	.....	.....	.....	.....	..	..	..	..
1 to 1½	evid't	.....	Yh	tender, juicy .	sweet, aromatic, delicious.	June 15 to 20.....	8	7	7	4
.....	.....	.....	....	.....	....	.....	..	..	..	..
.....	.....	.....	....	.....	.....	.....	..	..	..	..
1½ to 2, slender.	.....	.....	R	firm, breaking, juicy.	sweet and good .	June 25 to 30	8	7	10	10
1⅛.....	T	.....	Pa. Y., with red cheek.	firm, meaty, fairly juicy.	sweet, agreeable	July 1 to 6	8	8	9	9
.....	.....	... .	....	.....	.....	.....	..	..	..	..
....	.....	.....	.....	.....	.....	.....	..	..	..	..
stout, 1½ to 2	T	.....	pale Y	firm, breaking, juicy.	S, pleasant, delicious when ripe	June 25 to 30.....	8	8	8	8
.....	.....	..	.....	.....	.....	....	..	..	..	..
.....	.....	.....	.....	.....	.....	.....	..	..	..	..
....	.....	.....	.....	.....	.....	.....	..	..	..	..
1¼ to 2½	T	S	R..... ...	tender, very juicy.	sub-acid, v. good	June 12 to 20	7	10	9	

§ Inclined to rot; fruit does not set well; drops badly.
** Fruit in cluster—ripens unevenly.

PEARS

Tested at East Central Station, Whitby,

HABIT.—S., spreading; U., upright; D., drooping. CAVITY.—S., shallow; N., narrow; D., deep; R., red; Rus., russet; Sun, or sunny side. BASIN.—B, broad;

Number.	Variety.	Origin.	Tree.		Fruit.			
			Habit.	Age of bearing.	Size.	Form	Skin. Color.	Cavity.
1	Bartlett	Berkshire, England, 1770	U.S.	4	L	obt., obl. pyr	yellow	S
2	Beurre Clairgeau	Nantes, France	U	4	L	pyr	fawn and b.	U
3	Beurre d'Anjou	French	U.S.	10	L	obt, pyr	gr	B
4	Beurre Superfine	France in 1837	U	10	M	r., pyr	gr., rus	S
5	Beurre Antoine	French	U.S.	8	S	obv., pyr	y., gr	S
6	Belle Lucrative	Flemish pear	U	6	M	obv., glob	y. g	S
7	Brockworth Park	English	U	5	L	obl.,obt.,pyr	y. rus	S
8	Buffum	Rhode Island, U.S.	U	9	M	obl., obv	y. b	S
9	Clapp's Favorite	Dorchester, Mass., U.S	U.S.	10	L	obv.,ov., pyr	lemon y	S
10	Doyenne d'Ete	Van Mon's Seedling, 1823	U	6	S	r., oov	y. and r	S
11	Duchess d'Angouleme	Angers, France	U	9	V.L	obl., obv	gh. y	D
12	Flemish Beauty	Belgium	U.S.	6	L	obv.,obl,,pyr	rus. and g	N
13	Glout Morceau	Flemish	U.S.	8	V.L.	obv.,obl. pyr	yh. g	S
14	Goodale	Saco, Me	U.S.	9	L	obl., obv	yh. g	D
15	Graslin	French	U.S.	10	M.L	obv., ov., obl., pyr.	gh. y	S
16	Grey Doyenne		U.S.	5	S	obv, ov	y. with bl	N
17	Howell	New Haven, Conn.	U	5	M.L.	r., pyr	y	S
18	Josephine d'Malines	France	S	4	S	r., obl	gh. y	S
19	King Sessing	Phil., Pa	U	5	L	obt., pyr	gh. y	S.N.
20	Keiffer's Hybrid	Roxbury, Pa	U	3	M	r., ov., obl, pyr.	orange y	M
21	Lawrence	Flushing, Long Island	S	8	M	obl., obt., pyr.	light g	S
22	Louise Bonne	France	U	5	L	obl., pyr	pale g. and r	none
23	Mount Vernon	Roxbury, Mass	U	6	M.L	r., obt., pyr.	light rus	none
24	Pres. Drouard		U.S.	3	L	obl., obv., pyr.	yh. g	N
25	Rostiezer	Foreign	U	4	S	obv., obl., pyr.	yh. g., r. sun	none
26	Ritson	Oshawa, Ont	U	4	M	obv., ac.,pyr	yellow	S
27	Souvenir de Congres	Lyonaise, France	U	6	L	obl., obt., pyr.	yellow	D
28	Tyson	Inkertown, Penn	U	8	M	ac., pyr	clear deep y.	N
29	Sheldon	Wain Co., N.Y	very U	8	L	r., obt, obv.	rus. g. y	D
30	Winter Seckel	Fredericksburg, Pa	U	5	S	obv	gh. y	S
31	Winter Nelis	Flemish pear	U.S.	4	S.M.	r., obv	gh., y. with rus.	N

PEARS.

Ont.—R. L. HUGGARD, Experimenter.

B., broad. COLOR —B., brown; G., green; Gh., greenish; Y., yellow; Yh., yellowish; Bl., blush; D., deep; M, medium; Sh., shallow; Sm, small; Sl., slight.

Number.	Fruit.						
					Flesh.		
	Stem.	Basin.	Calyx.	Core.	Color.	Texture.	Flavor.
1	1¼ inch..	shallow ..	open	medium	white ..	mellow	vinous sweet.
2	⅜ in. stout	irregular .	open	small.....	yh	firm, crisp.....	sugary, vinous.
3	⅜ in. thick	shallow ..	sm., open.	small.....	wh.....	crisp, juicy	brisk, vinous.
4	½ in. stout	small	part closed	small.....	wh	buttery	vinous, sub-acid.
5	1 inch....	shallow ..	open . ..	medium	w.....	buttery	sweet.
6	1¼ inch ..	small	open	small.....	w.....	juicy, sugary	acid, delicious.
7	1 in. thick	small	closed	small.....	w.....	buttery, melting.....	rich and juicy.
8	1 inch....	medium .	small	small.....	w.....	firm, buttery	sweet and good.
9	1 inch....	shallow...	closed	large	w.....	fine grained	vinous, perfumed.
10	1½ inch...	slight	sm., open.	small.....	w.....	fine grained	mellow, juicy.
11	1½ inch...	knobby...	closed	large	w.....	crisp, juicy	excellent.
12	1½ inch...	small	small	small. ...	wh	buttery, fine.....	mushy, rich.
13	1 in. thick	deep	open	large	w.....	fine, mellow...	rich.
14	⅜ inch....	deep	sm., closed	large	w.....	sweet, firm..	vinous, mushy.
15	½ inch....	shallow ..	open	small	yh	juicy, melting	sweet, vinous.
16	½ inch....	shallow ..	sm., closed	.....	w.....	fine grained	buttery, rich.
17	1 inch....	large	open	.....	wh	tender, melting	brisk, vinous.
18	1½ inch...	broad, sh.	sm., open	....	pink &w	tender, crisp..	sweet, aromatic.
19	⅜ inch...	irregular .	closed	.....	w	coarse, granular	sweet, perfumed.
20	⅜ inch....	medium ..	open	.....	w.....	coarse, juicy.....	melting, sweet.
21	1 inch....	broad	open	.....	w.....	tender, melting	sweet.
22	1 inch....	shallow...	open	....	gh. w ..	juicy, melting	rich and melting.
23	⅜ inch....	shallow...	closed	.....	yh. w..	granular	vinous, aromatic.
24	1 inch...	broad	closed	.....	w.....	firm, crisp.....	sub-acid.
25	2 inches..	small	open	.....	gh. w ..	very mellow.....	sugary, aromatic.
26	1 inch....	small ...	"	.....	w.. ...	firm, melting.....	rich, juicy.
27	1½ inch...	broad	"	.....	w.....	granular, mellow	mushy, rich.
28	1⅜ inch...	shallow ..	"	....	w.....	fine, melting	sugary, aromatic.
29	1½ inch...	b., large..	"	.....	w.....	melting, juicy	sweet, vinous.
30	1 inch....	broad ..	"	....	w	coarse, granular	sweet, juicy.
31	1½ inch...	shallow ..	"	.....	yh. w..	fine, granular.....	sugary, aromatic.

PEARS.

EAST CENTRAL STATION

Number.	Variety.	When planted.	Soil.	Cultivation.	Fertilizer used.	Weather favorable or unfavorable.	Pruning.	
							Date.	Method.
1	Pres Drouard	1887	clay loam.	cultivated	stable manure.	dry	March, '96	cutting suckers.
2	Souv. du Congres	1887	"	"	"	"	"	"
3	Duchess d'Angouleme.	1887	"	"	"	"	"	"
4	Beurre d'Anjou	1889	"	"	"	"	"	"
5	Beurre Clairgeau	1891	"	in grass	coal ashes	"	"	"
6	Beurre Superfine	1887	"	"	"	"	"	"
7	Belle Lucrative	1889	"	"	"	"	"	"
8	Tyson		"	cultivated	manure	"	"	"
9	Buffam	1889	"	meadow	ashes	"	"	"
10	Ritson	1892	"	cultivated	manure	"	"	"
11	Keiffer	1887	"	meadow	ashes	"	"	"
12	Brockville Park	1889	"	cultivated	manure	"	"	"
13	Mt. Vernon	1889	"	meadow	ashes	"	"	"
14	Josephine d'Malines	1890	"	cultivated	manure	"	"	"
15	Beurre Antoine	1889	"	"	"	"	"	"
16	King Sessing	1889	"	meadow	"	"	"	
17	Doyenne d'Ete	1889	"	in grass	stable manure	"	Spring, '96	thinning suckers
18	Rosteizer	1889	"	"	"	"	"	"
19	Grey Doyenne	1889	"	"	"	"	"	"
20	Clapp's Favorite	1887	"	"	coal ashes	"	"	"
21	Bartlett	1887	"	"	"	"	"	"
22	Louise Bonne de Jersey	1887	"	"		"	"	"
23	Sheldon	1876	"	cultivated	stable manure	"	"	"
24	Howell	1889	"	in grass	ashes	"	"	"
25	Winter Nelis	1889	"	"	"	"	"	"
26	Flemish Beauty	1876	"	cultivated	stable manure	"	"	"
27	Winter Seckel	1889	"	in grass	coal ashes	"	"	"
28	Graslin	1889	"	"	"	"	"	"
29	Goodale	1887	"	"	"	"	"	"
30	Lawrence	1889	"	"	"	"	"	"
31	Glout Morceau	1889	"	"	"	"	"	"

PEARS.

RECORD FOR 1896.

Number.	Date of maturity.	Date of gathering.	Yield.	Grade per cent.			Storage.	Average price.	Remarks.
				Class 1.	Class 2.	Class 3.	Place.		
1	Dec., Jan..	Oct. 12..	4 baskets...	85	15	.....	barn cellar	not sold....	....
2	September .	Sept. 15..	3 " ..	70	30	.....	"	35c. basket.	.....
3	October	Oct. 2..	2 " ..	60	40	.....	"	not sold....	....
4	Oct., Nov..	Oct. 10..	1 " ..	90	10	....	"	"	....
5	Oct., Jan ..	Oct. 2..	½ " ..	90	10	.....	.....	.....	Small crop, but very nice fruit.
6	October	Oct. 17..	3 " ..	70	30	.....	barn cellar	not sold....	.....
7	last of Sept.	Sept. 15..	4 " ..	65	35	. ....	"	"	....
8	Aug., Sept.	Sept. 3..	4 " ..	75	25	.....	.....	35c. basket.	.. ..
9	September..	Sept. 20..	2 " ..	80	20	.....	.....	30c. "	Sold as soon as pkd.
10	November .	Oct 8 ..	1 " ..	100	.....	.....	barn cellar	.....	.....
11	Nov. & Dec.	Oct. 16..	9 " ..	75	25	.....	"	$3 barrel...	....
12	Dec. & Jan.	" 19 ..	2 " ..	70	20	10	"	not sold....	Tree too shaded.
13	Nov. & Dec.	" 9..	1 " ..	60	40	.....	"	"	....
14	Jan., Feb..	" 15..	2 " ..	75	25	.....	"	"	....
15	September..	Sept. 10..	2 " ..	70	30	.....	"	35c. basket.	....
16	September..	" 10..	2 " ..	75	25	.....	"	40c. basket.	.....
17	last of July.	July 20..	6 " ..	80	20	.....	.....	10c. quart..	Sold as soon as pkd.
18	Aug. & Sep.	Aug. 24..	4 " ..	90	10	.....	.....	60c. basket.	"
19	July	July 27..	2 " ..	80	20	.....	.....	50c. "	"
20	August.....	Aug. 20..	14 " ..	70	30	.....	.....	$1.75 bbl...	"
21	September..	Sept. 7..	1 " ..	60	40	.....	barn cellar	35c. basket.	.....
22	Sept. & Oct.	" 23..	¾ " ..	75	25	.....	"	$2 barrel ...	....
23	Oct. & Nov.	" 26..	1 " ..	60	40	.....	"	35c. basket.	.....
24	Sep. & Oct.	Oct. 1..	3 " ..	70	30	.....	....	25c. "	.....
25	Dec. & Jan.	" 3..	2 " ..	70	30	.....	barn cellar	30c. "	.....
26	Sep. & Oct.	Sept. 19..	9 " ..	60	40	.....	"	30c. "	....
27	Jan. & Mr'h	Oct. 1..	1 " ..	75	25	.....	"	35c. "	....
28	Oct. & Nov.	" 2..	2 " ..	100	.....	.....	"	not sold....	....
29	Oct. & Nov.	" 2..	3 " ..	85	15	.....	"	"	....
30	December ..	" 19 .	2 " ..	10	30	.....	"	"	.....
31	December ..	" 5..	3 " ..	90	10	.....	"	"	.....

PEARS.

BURLINGTON STATION RECORD FOR 1896.—

Variety.	Origin.	When planted.	Soil.	Cultivation.	Fertilizers used.	Weather favorable or unfavorable.
1. Anjou	Belgium....	1880	clay loam ..	Plowed once a year in the fall or spring, then clean cultivation until last of July. Seeded down once in every two or three years to check growth of wood.	On dwarf trees a good deal of stable manure; on standards on clay soil, also stable manure once in two years.	unfavorable.
2. Belle Lucrative	"	1889	grav. loam..			"
3. Bartlett	England ...	1880	clay loam ..			"
4. Clapp'sFavorite	Massachusetts	1889	grav. loam..			"
5. Duchess d'Angouleme	France	1889	grav. loam..			"
6. Flemish Beauty	.....	1880	clay loam ..			"

PLUMS.

GEORGIAN BAY STATION.—JOHN

HABIT.—S., Spreading; U., Upright; D., Drooping. FORM.—Ov., Oval; Glob., Globular. SUTURE.—Gh., Greenish; Gol., Golden;

Variety.	Origin.	Tree.			Fruit.	
		Habit.	Foliage.	Age of bearing.	Size.	Form.
Yellow Egg	....	U	healthy, medium quantity.	5	L	ov .....
Yellow Gage	.....	U	healthy, plentiful	4	M	ov . .....
Howard's Favorite..	E. Door, Albany, N.Y..	S to U	large size, medium quantity.	3	L	ov., narrowing toward stem.
Prince of Wales	English	U	medium quantity . . .	5	L	glob . .....
Early Black Damson	.....	S	healthy, medium quantity.	3	S	ov . ....
Jefferson	Judge Bell	U	large and plentiful.....	5	L	ov .....
Peach	....	S to U	large leaves, medium quantity.	4-5	L	roundish, much flattened at ends.
Duane's Purple.....	James Duane, Duanesberg, NY.	U	healthy, medium in size and plentiful.	4-5	M to L	ov. to obl ..

COMMERCIAL VARIETIES.

A. W. Peart, Freeman, Experimenter.

Pruning.		Insects.		Fungi.		Date of gathering.	Remarks.
Date.	Method.	Name.	Treatment.	Name.	Treatment.		
March..	Heading back young trees up to 5 or 6 years old, to	Slug, codlin moth, curculio.	Paris green.	Blight bacteria.	Cutting out and burning.	Oct. 10 20.	....
" ..	make them stocky	"	"	"	"	Sept. 15..	....
" ..	and more compact	"	"	"	"	" 1..	Blighted badly
" ..	in the top, and cutting out cross branches.	"	"	"	"	Aug. 20..	"
" ..		"	"	"	"	Oct. 15	.....
" ..		"	"	"	"	Sept 10..	.....

PLUMS.

Mitchell, Clarksburg, Experimenter.

L., Large; D., Distinct; Ob., Obscure; Obs., Obsolete. Color.—Cr., Crimson; P., Purple; R., Red; Rh., Reddish; Y., Yellow.

Fruit.—*Continued.*

Skin.		Cavity.	Stem.	Suture.	Stone.	Flesh.		
Color.	Bloom.					Color.	Texture.	Flavor.
Y	W	S and N	long.....	L	cling	Y	coarse....	rather acid.
Y	W	S	slender	Ob	cling	Y	juicy	rich.
pale Y dotted with Cr.	thin lilac	D and N	long.....	D	cling	Y	juicy	sweet.
R P	thick	I and N	short	D	nearly free .	Gh Y	juicy	sweet.
dark P	thick blue	.....	short	Ob	nearly free .	Y	juicy	rather tart.
gol. Y	thin white	S	long..	Ob	free	deep orange	juicy	rich, sweet.
pale Y	pale	N	short	D	free	Pale Y	juicy	sprightly.
R P	lilac	N	¾ in. long, slender.	D	partial cling	amber	juicy	moderately sweet.

PLUMS.

NIAGARA FRUIT EXPERIMENT STATION.—

HABIT.
S.—Spreading.
U.—Upright.
D.—Drooping.

CAVITY.
S.—Shallow.
N.—Narrow.
D.—Deep.
B.—Broad.

SUTURE.
L.—Large.
D.—Distinct.
Ob.—Obscure.
Obs.—Obsolete.

Variety.	Origin.	Tree.			Fruit.			
		Habit.	Foliage	Age of bearing.	Size.	Form.	Skin.	
							Color.	Bloom.
Prince's Yellow Gage	Mr. Prince, Flushing, L.I.	U.	lightish green, glossy	4	M	Ov	light Y	thin
Goliath		U.	healthy, abundant	5	L	R obl	R P	wh. thin
Jefferson	Judge Buell	S.	lightish green	..	L	Ov	Y, R cheek	light
Prince of Wales.	English	S.	plentiful, healthy	4	M-L	r obl	R P	heavy
Orange	Dutchess Coy. N.Y	U.	dark, abundant.	5	L	r ov	deep Y, dotted with W	m. whitish blue, thick
Moore's Arctic		S.	not luxuriant	3	S-M	Ov	Bl	
McLaughlin	Bangor, Maine	S.	broad crimped	5	M-L	R	Y marbled with R	light
Onlands' Golden Gage	European	U.	heavy rich green	..	L	r ov	Y	whitish
Lawrence's Favorite	Seedling of European Green Gage	U.	dark green	6	M-L	R	Yh	thin
Coe's Golden Drop	English	S.	large, abundant.	4	L	ov. irreg.	pale Y	thin
St. Catherine	French	U.	medium	5	M	Obov	Y mottled with B	thin
Columbia	Mr. Lawrence, Hudson, N.Y.	S.	abundant, healthy	5	L	R	Bl to P	bluish, heavy
Gueü		U.	crimped, broad	3	M	Con	deep R	heavy blue

PLUMS.

M. Burrell, St. Catharines, Experimenter.

FORM.

Con.—Conical.
Irreg.—Irregular.
Ov.—Oval.
Obl.—Oblong.
Obov.—Obovate.
R.—Round.
r.—Roundish.

COLOR.

B.—Blue.
P.—Purple.
R.—Red.
Gh.—Greenish.
G.—Green.
Rh.—Reddish.
Y.—Yellow.
Yh.—Yellowish.

Fruit.								
				Flesh.				
Cavity.	Stem.	Suture.	Stone.	Color.	Texture.	Flavor.	Season (Months of use as Dec.-Mar.)	Remarks.
N S....	Slender 1 in.	Ob.	free	Y.....	melting.....	sugary, rich	early Aug.	One of the earliest yellow plums.
D N ...	Stout, short	D..	cling ..	deep Y.	juicy	moderately rich...	Aug. 15 ..	
S	1 in. stoutish	Ob .	free ...	rich Y .	melting, juicy.	very rich, luscious.	last Aug..	
D N ...	½ in. stout..	D..	free ...	Y.....	juicy, coarsish	sweet,not very rich	end Aug..	
N S....	Stout 1 in..	D..	cling ..	Y	coarsish	pleasant, sub-acid.	Aug. 20 ..	Often condemned but is very hardy, a good bearer and a good preserving plum.
S N....	⅝ l'g slender.	D..	cling ..	gh. Y ..	firm.....	not rich	early Aug.	
S N....	¾ in. med...	Ob .	cling ..	dull Y .	juicy	very sweet and fine	last Aug..	
D	Medium....	Ob .	free ...	Y.. ...	firm	sweet, rich	Aug. 10 ..	
D N ...	Slender, sh't	D..	free ...	gh	juicy, melting	rich vinous	Aug. 20 ..	A fine plum for the amateur.
N & M.	1 in. stiff...	D..	cling ..	Y.....	juicy, firmish.	quite rich,delicious	end Sept..	
S N....	¾ in. very slender...	D..	partial cling..	Y	firm....	aromatic sub-acid.	Sept. 10 ..	
D N ...	1 in. stoutish	D..	free ...	deep Y.	firm.....	rich, sugary	Sept. 18..	A fine showy and profitable plum.
D N ...	¾ in. med...	Ob.	partial cling..	gh	firm.....	sprightly	Aug. 20 ..	A promising variety.

DESCRIPTIVE

Wentworth Experiment Station :

Species.—E. Æstivalis ; R. Riparia ; L. Labrusca ; H. Hybrid ; X. Cross. Size.—S. Small ; —C. Close; L. Loose ; St. Straggling. Shape of Berry.—Ov. Oval ; R.

Variety.	Vine.			Bunch.	
	Origin.	Species.	Foliage.	Form.	Compactness.
1 Concord	E. W. Bull, Concord, Mass	L	healthy	Sh	C
2 Delaware	Unknown	H	thin and weak	Sh	C
3 Pocklington	Seedling from Concord	L	healthy	S	C

GRAPES.—WENTWORTH

M. Pettit, Experimenter,

*Yield per tree, vine, bush or plant, an average of three ; of strawberries,

Variety.	When planted.	Soil.	Cultivation.	Fertilizers used.	Winter protection.	Pruning.	
						Method	System of training
1 Agawam	1887	Clay	Plowed in the spring, with frequent shallow cultivation after.	none	No winter protection.	Fan system on three wires.	Fan system on three wires
2 Brighton	1882	"					
3 Concord	1874	"					
4 Catawba	1883	"					
5 Delaware	1874	"					
6 Lindley	1887	"		stable manure			
7 Moore's Early	1887	"					
8 Moyer	1886	"					
9 Niagara	1882	"					
10 Worden	1884	"					
11 Wilder	1884	"		stable manure			
12 Salem	1884	"		"			

LIST OF GRAPES.

M. PETTIT, WINONA, EXPERIMENTER.

M. Medium; L. Large. FORM OF BUNCH.—L. Long; S. Short; Sh. Shouldered. COMPACTNESS. Round. COLOR.—B. Black; P. Purple; R. Red; W. White; L. Light; D. Dark.

Berry.							Remarks.
Size.	Shape.	Skin. Color.	Skin. Bloom.	Skin. Thickness.	Flavor.	Season (Months of use, as Oct., Nov.)	
large...	R	B	heavy ..	thin....	not the best ..	Sep., Oct.....	If carefully picked and not burst will keep in good condition from three to four weeks, but loses some in quality.
small...	R	R	thin....	thin....	best.....	Sep.	If carefully picked will keep two or three weeks in a cool dry place.
large.	R	W	thin....	thin....	good	Oct.....	

STATION RECORD FOR 1896.

WINONA, ONT.

an average of twelve. Of grapes and small fruits give weight.

Insects. Name.	Insects. Treatment.	Fungi. Name.	Fungi. Treatment.	Date of maturity.	Date of gathering. (Berries, first and last).	Yield.	Grade per cent. Class 1.	Grade per cent. Class 2.	Average price.	Remarks.
						lb.			c.	
thrip	none .	mildew.	sulphur	Oct. 7	Oct. 15-20....	18	15	3	2½	
....	" .		.....	Sep. 5	Sep. 11	7	7	....	3	Did not fertilize well.
.....	" .		.....	" 8	" 15-20....	18	18	....	1½	
....	" .		.....	Oct. 15	Oct. 20-25....	15	15	....	3	
thrip very bad	" .		....	Aug. 31	Sep. 1-10 ...	12	12	....	3½	
thrip	" .		.....	" 31	" 1-10 ...	14	14	....	3⅓	
.....	" .		.....	" 27	Aug. 27-31 ...	6	6	....	4	
thrip	" .		.....	" 21	" 21-25....	4½	4½	....	5	
.....	" .		.....	Sep. 7	Sep. 7-17 ..	16	16	....	2	
....	" .		.....	" 1	" 1-10....	17	17	....	2½	
thrip very bad	" .		.....	" 23	" 23-30 ...	15	15	....	2⅔	
" "	" .		.....	" 10	" 10-20....	16	16	....	3	

Very little mildew.

None of the Rogers, Niagara or Brighton fertilized properly; they bloomed very full and set but dropped off soon after the bloom.

GOOSE-

SIMCOE GOOSEBERRY SUB-STATION.—

SIZE.—S., Small; M., Medium; L., Large. FORM.—L., Long; S., Short; Sh., Shouldered. COMPACT-
COLOR.—R., Red; B., Black; W., White; G., Green;

Variety.	Plant.				
	Origin.	Foliage.	Vigor. Scale 1-10.	Productiveness. Scale 1-10.	Freedom from mildew 1-10.
Autocrat	Canadian, possibly Eng. origin	Fair	7	8	8
Carnie's Golden	Eng. Seedling	Good	9		9
Champion	Delphi, Ind., U. S.		9	10	8
Champion	Eng	V. G	9		10
Chautauqua	Foreign	Fair	8		8
Columbus	Eng. Seedling	Fair	8		8
Crosby's Seedling	Eng. Seedling	Good	9		9
Crown Bob	Eng	Good	8		8
Downing	American	Fair	8	9	9
Lancashire Lad	Eng	Fair	7		8
Pearl	Canadian	Good	9	9	9
Queen	German	Good	9		9
Red Jacket	American	V. G	9		9
Triumph	Eng. Seedling	Good	7	8	8
Whitesmith	Eng	Fair	8	8	7

GOOSEBERRY SUB-STATION

STANLEY SPILLETT,

Variety.	When planted.	Soil.	Cultivation.	Fertilizers used.	Winter protection.
Autocrat	1890	Clayey	Constant cultivation	Barnyard manure, hardwood ashes, nitrate of soda.	None
Champion	1893	"	"	"	"
Chautauqua	1894	"	"	"	"
Downing	1886	"	"	"	"
Lancaster Lad	1893	"	"	"	"
Pearl	1892	"	"	"	"
Queen	1894	"	"	"	"
Red Jacket	1894	"	"	"	"
Triumph	1894	"	"	"	"
Whitesmith	1890	"	"	"	"
Carnie's Golden	1895	"	"	"	"
Crosby's Seedling	1895	"	"	"	"
Crown B. & B	1895	"	"	"	"
Champion	1895	"	"	"	"
Columbus	1895	"	"	"	"

BERRIES.

S. SPILLETT, NANTYE, EXPERIMENTER.

NESS.—C., Close; L., Loose; St., Straggling. FORM OF BERRY.—R., Round; Ov., Oval; Ob., Oblong. Y., Yellow. SEASON.—E., Early; M., Medium; L., Late.

Berry.					Value. Scale 1-10.		Remarks.
Size.	Form.	Color.	Flavor.	Season.	Dessert.	Market.	
V. L.	Ob	G	V. G.	L	10	10	
L	Ov	G	G		9	10	Promising.
M	Ov	G. W.	Fair	M	6	8	Lowered one point for mildew.
M	Ov	G. W.		M			
L	Ov	G. W.	G	M	9	10	
							Promising.
M	R	G. W.	G	M	9	8	
L	Ov	R	V. G.	E	10	10	
M	R	G. W.	G	M.	9	10	
L	Ov	G. W.	G	M	9	10	
L	R	R	G	M	9	10	
V. L.	Ov	G. W.	G	M	9	10	
V. L.	Ob	G. W.	G	M	9	10	

RECORD FOR 1896.

NANTYE, EXPERIMENTER.

Weather favorable or unfavorable.	Pruning.		Insects.		Fungi.	
	Date.	Method.	Name.	Treatment.	Name.	Treatment.
Unfavorable; early part of season very dry.	24th October	Clearing away all branches underneath; thinning out heads; leaving about six stems.	Currant worm	Sprayed with Paris green.	Mildew	Liver of sulphur and Bordeaux mixture.
"	"	"	"	"	"	"
"	"	"	"	"	"	"
"	"	"	"	"	"	"
"	"	"	"	"	"	"
"	"	"	"	"	"	"
"	"	"	"	"	"	"
"	"	"	"	"	"	"
"	"	"	"	"	"	"
"	"	Shrub system	"	"	"	"
"	"	"	"	"	"	"
"	"	"	"	"	"	"
"	"	"	"	"	"	"
"	"	"	"	"	"	"

BLACKBERRIES.

TESTED AT BURLINGTON STATION.—

SIZE—S., small; M., medium; L., large. FORM.—R., round; C., Conical; O., ovate. COLOR.—E., early; M.,

Variety.	Plant.						
	Canes.			Foliage.	Vigor. Scale 1-10.	Hardiness. Scale 1-10.	Productiveness. Scale 1-10.
	Habit of Growth.	Color 2nd Nov.	Freedom from disease 1-10.				
Agawam	up. spr.	br. red..	9	healthy.	8	10	7
Early Cluster	up	br.	9	"	8	10	3
Early Harvest	up	br.	9	"	8	6	4
Erie	spr.	br	9	"	7	10	8
Gainor	up.	br	9	"	8	10	8
Kittatinny	up.	r. br.	9	"	9	9	10
Lovett's Best	up.	light br.	9	"	9	10	5
Maxwell	we'k.spr	r. gr.	9	"	5	10	8
Ohmer	up. spr.	r. br.	10	"	8	10	8
Snider	up.	dark red	10	"	9	10	10
Stone's Hardy	up. spr.	br.	9	"	8	9	8
Taylor	up.	r. br.	9	"	7	10	9
Wachusetts	spr.	r. br.	9	"	8	10	8
Western Triumph.	up.	r. br.	10	"	10	10	9

BLACKBERRIES.

BURLINGTON STATION RECORD FOR 1896.

Variety.	When planted.	Soil.	Cultivation.	Fertilizers used.	Winter protection.	*Time of blooming.	Date of maturity.	Date of gathering berries (1st and last.)
Agawam	1895	Rich gravelly loam.	See raspberries	none.	none.	June 10	July 20.	July 20-Aug. 20
Erie	1895	"		"	"	June 12.	July 25.	July 25-Aug. 10
Gainor	1895	"		"	"	June 11.	July 20.	July 20
Kittatinny	1895	"		"	"	June 15.	Aug. 1.	Aug. 1-25
Lovett's Best	1895	"		"	"	June 11.	Aug. 1.	Aug. 1-21
Maxwell	1895	"		"	"	June 13	July 15.	July 15-Aug. 10
Ohmer	1895	"		"	"	June 11	July 20.	July 20-Aug. 10
Snider	1895	"		"	"	June 10.	July 25.	July 25-Aug. 15
Stone's Hardy	1895	"		"	"	June 9.	July 25.	July 25-Aug. 15
Taylor	1895	"		"	"	June 8.	July 20.	July 20-Aug. 10
Wachusetts	1895	"		"	"	June 9.	July 20.	July 20-Aug. 1
Western Triumph.	1895	"		"	"	June 9.	July 20.	July 20-Aug. 12

* The dates here represent full bloom.

BLACKBERRIES.

A. W. PEART, EXPERIMENTER, FREEMAN.

D., dark ; R., red ; P., purple ; O., orange ; B., bright. FLESH.—F., firm ; S., soft. SEASON.—medium ; L., late.

Berry.					Value. Scale 1-10.		Remarks.
Size.	Form.	Color.	Flavor.	Season.	Dessert.	Market.	
M	O.R.	B.	Insipid	M.	5	6	
S	O.R.	B.	Sprightly	L.	5	5	
S	O.C.	B.	Poor	L.	1	3	
M.L	O.R.	B.	Pleasant	M.	7	8	
V. L.	O.R.	B.	Sweet, sprightly	E.	9	9	Very large berry.
L	O.C.	B.	The best	L.	10	10	
S	O.R.	B.	Poor	M.	5	4	
L	O.R.	B.	Inferior	M.	5	8	Very thorny.
L	O.C.	B.	Good, sprightly	M.	8	8	Very large berry.
M	O.C.	B.	Sweet, good	M.	8	8	
S.M.	O.C.	B.	Pleasant, sprightly	M.	8	8	
M.	O.C.	B	Fine	M.	9	7	Very thorny.
S. M.	O.R.	B.	Fine, sweet	M.	9	7	
M	O.R.	B.	Fine	M.	9	9	Very thorny.

RASPBERRIES—BURLINGTON

A. W. PEART,

SIZE.—S. small; M., medium; L., large. FORM.—R., round: C., conical; O., ovate. SEASON.—E., early;

Variety.	Plant. Canes. Habit of growth.	Color 2nd Nov.	Freedom from disease 1-10.	Propagation by tips or suckers.	Foliage.	Vigor. Scale 1-10.	Hardiness. Scale 1-10	Productiveness. Scale 1-10.
All Summer	up. spr.	br	9	S	healthy	6	10	8
Columbian	very strong, spr. up.	red	10	T.	very healthy	10	10	10
Cuthbert	up	dark red	8	S	healthy	9	9	9
Hilborn	up	br	10	T.	"	9	10	10
Kansas	up. spr.	dull red.	10	T.	very healthy	10	10	10
Lovett	up. spr.	"	9	S	healthy	8	10	8
Marlboro'	up. spr.	"	10	S	"	8	10	8
Older	up	br	10	T.	"	9	9	7
Palmer	up	dull red.	9	T.	"	9	10	7
Progress	up	dark red	9	T.	"	8	10	5
Thompson	up	dull red.	10	S	"	7	10	7
Shaffer's Colossal	up	br	10	T.	"	10	10	10

RASPBERRIES—BURLINGTON

Variety.	When planted.	Soil.	Cultivation.	Fertilizers used.	Winter protection.	Weather favorable or unfavorable.
All Summer	1895	Rich gravelly loam	Ploughed in spring, then frequent cultivation and hoeing until fruit is ripe.	none	none	Too dry during the early part of the season.
Columbian	1895	" "		"	"	
Cuthbert	1894	" "		"	"	
Hilborn	1895	" "		"	"	
Kansas	1895	" "		"	"	
Lovett	1895	" "		"	"	
Marlboro'	1894	" "		"	"	
Older	1895	" "		"	"	
Palmer	1895	" "		"	"	
Progress	1895	" "		"	"	
Shaffer's Colossal	1895	" "		"	"	
Thompson	1895	" "		"	"	

* The dates here

FRUIT EXPERIMENT STATION.

FREEMAN, EXPERIMENTER.

COLOR.—D., dark; R., red; P., purple; O., orange; B., bright. FLESH.—F., firm; S., soft. M., medium; L., late.

Berry.					Value. Scale 1-10.		
Size.	Form.	Color.	Flavor.	Season.	Dessert.	Market.	Remarks.
M	R.	R.	Aromatic, sweet	E. L.	8	8	Fruits from July to Oct.
M	R.	R.P.	Sweet, sprightly	M.	7	8	Offers well.
L	R.	R.	Excellent	M. L.	10	10	One of our very best.
M	R.	B.	"	E.	9	8	
L	R.	B.	The best	E.	10	10	The best black cap here.
M	R.	R.	Fair	M.	6	8	
L	R.	R.	"	E.	7	10	
L	R.	R.	Inferior	E.	4	9	
M	R.	B.	Sweet	E.	9	8	
S.M.	R.	B.	Good	E.	8	8	
M	R.	R.	Poor	M.	2	7	
L	R.	P.	Only fair	M.	5	8	

STATION RECORD FOR 1896.

Pruning.		*Time of blooming.	Date of maturity.	Date of gathering (berries 1st and last.)	Yield.	Remarks.
Date.	Method.				lb.	
Annual pruning in early April. Summer pruning in August, of young canes, shortening back to make them stocky, and throw out laterals. Old canes removed in spring at annual pruning.		June 10	July 4	July 4-Oct. 15	..	Blooms and fruits from June 10 to Oct. 15.
		June 17	July 20	July 20-31	1⅜	
		June 20	July 15	July 15-31	....	
		June 8	July 1	July 1-10	⅔	
		June 6	July 1	July 1-10	1¼	The best B.R. so far.
		June 17	July 15	July 15-31	....	
		June 15	July 1	July 1-20	....	
		June 6	July 4	July 4-13	½	
		June 3	July 1	July 1 15	¼	
		June 3	July 1	....	...	
		June 20	July 20	July 20-31	1⅓	
		June 9	July 20	July 20-31	...	

represent full bloom.

RASPBERRIES—

G. C. Caston,

Size.
S—Small.
M—Medium.
L—Large.

Form.
R—Round.
C—Conical.
O—Ovate.

Color.
D—Dark.
R—Red.
P—Purple.
O—Orange.
B—Bright.

Variety.	Origin.	Plant.							
		Canes.				Foliage.	Vigor. Scale 1-10.	Hardiness. Scale 1-10.	Productiveness. Scale 1-10.
		Habit of growth.	Color.	Freedom from disease 1-10.	Propagation by tips or suckers.				
Cuthbert		vigorous	R	9	suckers	healthy	9	7	9
Marlboro'		"	R	9	"	"	9	9	9
Golden Queen	Seedling of Cuthbert	fair	P	9	"	"	8	7	
Shaffer's Colossal	Cross between red and black.	vigorous		7	tips	M	9	9	9
Columbian		"		9	"	healthy	10	9	10
Older		"		9	"	"	9	9	8
Gregg		fair		4	"	fair	7	8	8

BLACK

Variety.	Plant.							
	Canes.				Foliage.	Vigor. Scale 1-10.	Hardiness. Scale 1-10.	Productiveness. Scale 1-10.
	Habit of growth.	Color.	Freedom from disease 1-10.	Propagation by tips or suckers.				
Snyder	vigorous	R	10	suckers	healthy	10	10	9

SIMCOE STATION.

EXPERIMENTER.

Flesh.
F—Firm.
S—Soft.

Season.
E—Early.
M—Medium.
L—Late.

Berry.							Value. Scale 1-10.		Remarks.
Size.	Form.	Color.	Tenacity (*i.e.* to calyx or receptacle).	Flesh.	Flavor.	Flesh.	Dessert.	Market.	
L	R	R	good	F	good	L	10	10	The best red.
L	R	R	"	F	M	E	6	9	
L	R	O	"	F	good	M.	9	9	
L	R	D.	fair	S	M	M.	7	6	Subject to anthracnose.
L	R	D.	good	M.	fair to good	Late	8	9	Very promising variety.
M.	R	Bl'ck.	"	S	best	L.	10	8	Soft but of good quality.
L	R	Bl'ck.	"	F	poor	L.	5	8	Subject to blight.

BERRIES.

Berry.							Value. Scale 1-10.		Remarks.
Size.	Form.	Color.	Tenacity.	Flesh.	Flavor.	Season.	Dessert.	Market.	
M.	C.	Bl'ck.	good	F	fair	M.	7	7	Very hardy, but quality poor.

STRAWBERRIES.

TESTED AT STRAWBERRY SUB-STATION, GUELPH;

Size: S, Small; M, Medium; L, Large.
Form: B, Broad; C, Conical; D, Depressed; I, Irregular; L, Long; O, Ovate; R Round.
Color: B, Bright; C, Crimson; D, Dark; L, Light; R, Red; S, Scarlet

Number.	Variety.	Plant. Sex.	Origin.	Foliage. Healthy or liable to rust.	Fruit stalk.	Vigor. Scale 1-10.	Productiveness. Scale 1-10.
1	Aroma	S	From Cumberland and by E. W. Cruse, Kansas	very healthy	M to L	8	9
2	Arrow	P	From Haverland, by E. Cone, Wis	healthy	L	7	6
3	Afton	P	Chance seedling, from New York	quite healthy	M	9	10
4	America	S	From Great American, Virginia	healthy	M to L	8	8
5	Annie Laurie	S	By Mr. Beaur, Ohio	healthy	M to L	8	8
6	Allen	P	By W. F. Allen, Md	healthy	M to L	8	8
7	Allen's No. 6	P	By W. F. Allen, Md	healthy	M	9	8
8	Bubach	P	By J. G. Bubach, Ill	very healthy	S to M	6	9
9	Beverly	S	From Miner's P, by B. M. Smith, Mass.	healthy	M to L	6	7
10	Beder Wood	S	By B. Wood, Ill	some rust	M to L	8	9
11	Boynton	P	From Crescent x Sharpless, N. Y	healthy	M	9	9
12	Bouncer	S	From Jersey 2 x Miner, by Mr. Ball, Ct.	healthy	M	7	7
13	Bisel	P	From Wilson, by D. Bisel, Ill	some rust	S to M	9	9
14	Brandywine	S	From Glendale x Cumberland, by E. Ingram, Pa.	healthy	M	10	7
15	Belle	S	Unknown, by M. T. Thompson, Va	healthy	M to L	7	7
16	Beede's No. 1	S	G. F. Beede, N. H	very healthy	M	8	6
17	Beauty	S	Unknown	very healthy	M to L	8	8
18	Brunette	S	G. Cowing, Ind	healthy	M	7	6
19	Banquet	S	Supposed cross with wild strawberries.	healthy	M	7	6
20	Berlin	P	From Bubach, by J. Harrison, Md	healthy	M	8	8
21	B. No. 3	....	From Buback x Jessie, by E. B. Stevenson, Ont	very healthy	M	9	9
22	Carrie	P	From Haverland, by M. T. Thompson, Va	healthy	L	9	8
23	Clyde	S	From Cyclone, by Dr. Stayman, Ka	very healthy	M	10	10
24	Cyclone	S	From Crescent x Cumberland, by E. W. Cruse, Ka	very healthy	L	9	9
25	Charlie	P	From mixed seed, by M. Thompson, Va.	very healthy	L	8	6
26	Crescent	P	By Mr. Parmely, Conn	healthy	M	9	10
27	"Della K."	S	From Sharpless, by E. B. Stevenson, Ont	healthy	M to L	9	8
28	Dew	S	From Manchester x Sharpless, by Mr. Dew, Mich	healthy	M to L	7	5
29	Enhance	S	From Windsor C, x Sharpless, by Mr Young, Ohio	healthy	M	9	8
30	Edgar Queen	P	By Mr. Curtis, Ill	some dust	M	7	5
31	Epping	P	By G. Dow, N.H	healthy	M	8	6
32	Enormous	P	From Crescent, by Mr. Curtis, Ill	healthy	M to L	8	8
33	Effie May	S	Unknown, by C. C. Stone, Ill	very healthy	M	8	6
34	Edith	P	Chance seedling, by M. Thompson, Va.	healthy	M to L	7	8
35	Equinox	S	From Mt Vernon, by M. Thompson, Va.	some rust	L	8	8
36	Eleanor	S	Chance, Seedling, by Mr. Coombe, N.J.	healthy	M	9	9
37	Fremont	S	From Belmont, by G. F. Beede, N.H.	healthy	M to L	8	7
38	Gardner	S	Found wild from Iowa	healthy	M to L	7	6
39	Giant	S	Chance seedling from N. Y	healthy	M	8	8
40	Grenville	P	Chance seedling, by E. Beuchly, Ohio	very healthy	S to M	9	10
41	Glenfield	S	From Warfield x Glendale, by Dr. Stayman, Kansas	healthy	M to L	7	6
42	Gov. Hoard	S	By F. W. Loudon, Wis	healthy	M to L	8	6
43	Gertrude	S	Chance seedling, C. C. Stone, Ill	healthy	S to M	9	7
44	Gandy Belle	S	Unknown from N.J	healthy	M	8	7
45	Glen Mary	S	Chance seedling, by J. A. Ingram, Pa.	very healthy	M	9	9

STRAWBERRIES.

E. B. Stevenson, Freeman, Experimenter.

Flesh : F, Firm ; S, Soft.

Season : E, Early ; M, Medium ; L, Late.

Number.	Berry. Size.	Form.	Color.	Date of first bloom.	Date of first picking.	Flesh.	Flavor.	Season.	Value. Scale 1-10. Dessert.	Market.	Remarks.
				May	June						
1	L	RC	DR	18	11	F	good	L	8	9	A very good one.
2	M to L	L	BR	M16	.....	F	fair	M	8	7	Worth a trial.
3	M	C	DC	6	.....	F	good	E to M	6	9	A second Walfield.
4	M to S	C	LC	..	12	F	good	E to M	9	8	A fair one.
5	M to L	R	BS	21	... ..	VF	very best.	VL	10	7	Fine flavor.
6	M to L	L	BR	17	.....	F	fine	M	8	8	Further trial.
7	M	RC	DS	16	11	F	good	E to M	7	7	Another year's trial.
8	VL	RC	BS	10	6	Med	good	M	8	10	One of the standards.
9	M to L	RC	DR	21	9	F	fine	M to L	8	9	Worth trying.
10	M	R	LR	6	5	S	only fair .	E	6	9 6	Near. Distant, fair early.
11	M to S	C	R	.....	.....	M to S	good	E to M	6	8	Very like Crescent.
12	M	RCI	.....	18	13	M	medium ..	M	7	7	Another trial.
13	M to L	C	BR	20	12	F	good	M	8	9	A good one for market.
14	M to L	RC	DS	21	12	F	good	M to L	8	9	Worth trying.
15	L	L	S	18	12	F	good	L	8	7	A good one.
16	M	RC	BS	.....	9	F	good	M	9	7	Fine to eat.
17	L	RC	BR	18	8	M	good.	M	8	8	A good one.
18	M to L	RC	DR	16	13	F	very good.	M	10	7	A fine one.
19	M	C	R	28	13	F	good	M	9	7	Fair.
20	L	RC	DR	9	5	Med	fair	M	7	7	Another trial.
21	M to L	RC	DR	.....	...	F	good	M	8	8	A good one.
22	L	L	BS	18	9	F	good	M	8	9	A good one.
23	L	RC	BS	9	4	VF	good	E to M	9	10	One of best.
24	M to L	C	BS	6	6	F	good	E	8	9	A good one.
25	M	LC	DS	.. ...	14	F	good	M	8	6	Not valuable.
26	S to M	C	BS	.....	.....	Med	good	E to M	7	8	Too small.
27	L	C	BDS	22	18	F	good	L	9	9	Further trial.
28	VL	I	DS	12	12	F	good	M	7	5	Not yield enough.
29	L	LC	DC	16	.....	VF	fair	L	6	9	A good one.
30	M to L	RC	LC	.....	.....	F	fair	M to L	7	6	Not valuable.
31	M	RC	LR	.....	.....	M	only fair .	M	6	8	Not do well here.
32	M to L	IR	DR	18	.....	M	fair	M	7	8	Worth a trial.
33	M	C	LR	.....	10	M	medium .	M	7	8	Not valuable.
34	VL	I	BR	.....	....	F	fair	M	7	8	Very irregular.
35	M	RC	DR	18	.....	F	good	VL	8	8	A good one.
36	L	RC	C	Apl 30	M'y 29	F	good	EE	8	9	A good one.
37	M	C	BR	May	J'ne15	F	fine	M	8	6	
38	M to L	C	LR	8	14	F	good	M to L	7	6	Another trial.
39	L	RC	S	15	12	M	good	M to L	7	8	Worth a trial.
40	L	RC	BR	14	9	M	good	M	8	10 6	Near. Distant, one of best.
41	M	C	DC	16	3	F	good	M	10	8	Best quality.
42	L	RC	BR	... .	.. .	F	very good.	L	9	8	Not productive.
43	M	RC	S	18	11	M	good	M	7	6	Not valuable here.
44	L	RC	DS	18	12	F	fair	M	8	7	Does well in some places.
45	L	RC	C	.....	16	F	good	M to L	8	9	Worth a trial.

STRAWBERRIES

Number.	Variety.	Plant. Sex.	Origin.	Foliage. Healthy or liable to rust.	Fruit stalk.	Vigor. Scale 1-10.	Productiveness. Scale 1-10.
46	H. W. Beecher	S	From Champion x Sharpless, by H. H. Alley, N. J.....	very healthy.....	M	9	6
47	Haverland	P	Mr. Haverland, from Ohio	very healthy.....	L	9	10
48	Howard's No. 25....	S	From Haverland x Belmont, by A. B. Howard, Mass.	some rust.....	M	8	5
49	Howard's No. 41....	P	From Haverland x Belmont, by A. B. Howard, Mass	healthy	M	9	8
50	Howard's No. 501...	S	From Jersey 2 x Wilson, by A. B. Howard, Mass.....	healthy	M to S	9	8
51	Hersey	S	By Mr. S. Hersey, Mass.....	h'lthy, some rust.	M to S	7	6
52	Hatch Ex. Stn. No. 24	S	By Hatch Experiment Station, Mass ..	h'lthy, some rust.	M to S	7	6
53	Hunt's No. 3	S	By T. R. Hunt, N.J.....	very healthy	M	9	8
54	Huntsman.....	SP	By W. A. Huntsman, Mo	h'lthy, some rust.	M to S	8	8
55	Hiawatha	S	From Aroma, by Dr. Suayman	very healthy	M	10	7
56	Hull's No. 3.....	S	By E. J. Hull, Pa	healthy	M	9	8
57	Iowa Beauty	S	Unknown, C. P. Walworth, Ia.....	healthy	M	7	7
58	Ivanhoe	S	From Prince of Berries, by G. W. Trowbridge, Ohio.....	healthy	M	7	7
59	Irene	P	By Mr. Riehl, Ill	healthy	M	8	7
60	Jessie	S	From Sharpless, by F. W. Loudon, Wis.	very healthy	M	9	6
61	Jucunda Improved..	S	From Old Jucunda, by A. Gerbert, Pa.	some rust	M to S	8	7
62	Jersey Queen	P	Uuknown	very healthy	S	7	8
63	Judsonia	S	Unknown	some rust	M	7	6
64	Jarabolo	S	From Mrs. Cleveland, by Dr. Stayman, Ka	h'lthy, stools out.	M	8	7
65	Kansas Prolific	S	From Warfield, by Dr. Stayman	very healthy	S to M	9	7
66	Lord Sheffield.....	S	From England	h'lthy, some rust.	M	8	8
67	Leader	S	By J. B. Campbell, Mass	healthy	M to L	7	7
68	Longfield	P	From Warfield, by Dr. Stayman, Ka ..	very healthy	M to L	10	9
69	Leroy	P	By J. H. Haynes	healthy	M	8	8
70	Lovett's.....	S	From Crescent x Wilson, by J. H. Norris, Ka	h'lthy, some rust.	M to L	9	7
71	Leniathan	S	From Sharpless, by Mr. Wolfgang, Ohio	healthy	M	8	7
72	Lady Franklin	P	From Sharpless, by Mr. Wolfgang, Ohio	healthy	S to M	9	6
73	Magnate	P	From Warfield, by Dr. Stayman	healthy	L	8	6
74	Maple Bank.....	P	By Wm. Stevenson, Ont	h'lthy, some rust.	M	8	8
75	Michel's Early.....	S	Chance, through Crescent, J. G. Michel, Ark.....	healthy	S to M	10	5
76	Muskingum	S	By G. Kearns, Ohio	healthy	M	8	6
77	Mary	P	From Windsor, Chief, by H. H. Alley, N. J	healthy	M to L	8	8
78	Margaret	P	From the Crawford, by J. F. Beaur, Oh.	healthy	M	9	8
79	Mrs. Cleveland	P	From Cumberland, by Geo. Townsend, Ohio	healthy	M	8	6
80	Murray	S	Supposed from Crescent	healthy	M	8	7
81	Marshal.....	S	Chance seedling, Mr. Ewell, Mass.....	some rust.....	M to L	8	7
82	No Name	S	Unknown frem N. J.....	healthy	M	8	7
83	Northern.....	S	Unknown	very healthy	S to M	8	7
84	Ohio Centennial....	SP	Unknown	h'lthy, some rust.	S	6	8
85	Oberholtzer's No. 3 .	P	By D. Oberholtzer, Ohio.....	healthy	M	8	8
86	Pine Hill No. 20....	P	By C. G. Bushnell, Conn	healthy	L	7	7
87	Phillips	S	From Crescent x Sharpless.....	some rust	S to M	9	7
88	Princess.....	P	By J. C. Kramer, Minn., unknown parentage	healthy	M	7	6
89	Paris King	S	By C O. Curtis, Ill	healthy	L	8	7
90	Prince of Berries....	P	Seedling, Jersey Queen	very healthy	L	8	8
91	Princeton Chief	P	Supposed Crescent x Kentucky, by F. W. Pascharsky	some rust	L	8	5

—*Continued.*

Number.	Berry. Size.	Form.	Color.	Date of first bloom.	Date of first picking.	Flesh.	Flavor.	Season.	Value. Scale 1-10. Dessert.	Market.	Remarks.
46	M	RI	DC	May 24	.....	F	good	L	6	6	Not valuable.
47	L	L	BS	6	M'y30	M	fair . ..	E to M	8	10 / 6	Near. / Distant. } One of best.
							good	M	9	6	Not valuable.
48	M	RC	DR	8	June 7	F	good	M	9	8	Worth a trial.
49	L	RC	BC	14	12	M	good	M	8	8	A good one.
50	M	R	BR	.....	.....	F	good	M	7	6	Not valuable here, another trial.
51	M to S	BCD	DR	21	.....	F	fair	M	8	6	Only medium.
52	L	R	DR	16	14	S to M	fair	M	8	8	Worth a trial.
53	L	RC	C	19	7	F	good	M	8	7	A fair one.
54	L	R	DC	15	7	S to M	m to good.	M	8	8	Worth trying.
55	M	R	S	23	12	M	fair	M	7	7	Further trial.
56	M to L	RC	DR	20	14	M	medium ..	M	10	7	Fine quality.
57	L	RC	DS	1	12	F	very good.	M to L	6	7	No good here.
58	M	C	BR	.....	12	F	good	M	7	7	Further trial.
59	M	C	DR	14	11	F	fair	E to M	9	8	Not productive enough.
60	L	RC	BR	2	6	F	best	M	9	7	Not productive enough.
61	L	C	BS	....	.....	F	very good.	VS	8	9	One of best lates.
62	L	R	BS	.....	15	M	good	M	7	7	Not much good.
63	M to L	RBC	LC	.....	.....	M	fair	M to L	7	8	Further trial.
64	L	RC	BR	12	16	F	fair	M	8	8	Worth trying.
65	M	RC	BS	14	3	F	good	M	8	7	Did the best of the English kinds with me.
66	L	C	BC	8	6	F					
67	L	C	DR	8	4	F	good	E	10	7	Good one for amatures.
68	M to L	LC	DC	20	6 .	VF	very good.	L	8	10	One of best.
69	M	DRC	DR	.....	.....	M	good	M	8	7	Another trial.
70	M to L	RC	DR	14	4	F	good sprightly	M	7	8	Worth a trial.
71	L	BD	LS	15	12	F	medium .	M to L	8	6	Not ripen early, not as good as Sharpless.
72	L	RC	BR	16	12	F	good	M	8	6	Not productive enough.
73	M	LC	BR	16	10	F	very good.	M	8	6	Not productive enough.
74	M to L	RC	DC	14	10	VF	good	M to L	9	8	Worth trying.
75	S to M	R	LS	5	M'y29	M	good	EE	6	8	Did well this year.
76	M to L	DC	BR	.....	.....	F	good	M to L	8	7	Worth a trial.
77	L	RC	DR	14	J'ne13	F	good	M	7	9	A good one.
78	L	RC	C	12	8	F	good	M	9	8	A good one.
79	L	R	BR	.....	4	M to S	good	M	8	6	Too soft for market.
80	M	RC	DR	15	.....	M	good	E to M	7	7	Further trial.
81	V L	RL	DC	21	12	F	good	M	8	7	Wants petting.
82	L	RC	DS	.....	12	F	good	M	8	7	
83	S	R	BS	.....	12	F	good	E	8	6	Not much good.
84	V L	BRC	BS	....	14	F	good'....	M to L	9	7	Valuable.
85	L	RC	BC	.....	15	F	good	M	8	7	
86	M	R	BR	18	11	F	good	M	9	6	Not valuable.
87	L	RC	DR	14	11	F	good	M to L	8	7	Worth trying.
88	M	R	S	.....	.....	F	medium ..	M	7	7	
89	M to L	LC	BR	15	8	F	good	M	8	8	A good pollenizer.
90	M to L	RC	BR	.....	.....	M	good	L	7	8	Worth growing.
91	M	R	DR	. ....	.....	M	good	L	7	7	Not much value.

STRAWBERRIES

Number.	Variety.	Sex.	Plant. Origin.	Foliage. Healthy or liable to rust.	Fruit stalk.	Vigor. Scale 1-10.	Productiveness. Scale 1-10.
92	Plow City	S	From Sharpless, by C. C. Stone, Ill	healthy	M to L	7	7
93	Robinson	S	From Crescent x Chas. Downing, by by J. G. Robinson, Ka	healthy	M	8	8
94	Rio	S	From Sharpless, by M. T. Thompson, Va.	healthy	S to M	9	8
95	Richmond	S	By M. T. Thompson, Va	healthy	M	7	6
96	Ruby	S	By M. Riehl, Ill	very healthy	M	9	9
97	Roser	S	By E. L. Roser, Ohio	healthy	M	9	8
98	Staples	S	From Warfield, by Mr. Staples, Ohio	healthy	M	8	9
99	Smith	S	By L. Smith, Wis	healthy	S to M	10	8
100	Saunders	S	By J. Little, Ont	h'lthy, some rust.	M	9	9
101	Sunnyside	P	By C. S. Pratt. Mass	healthy	M	8	8
102	Snowball	S	By E. Cone, Wis	rusts some	M to L	9	5
103	Splendid	S	By C. H. Summer, Ill	very healthy	M	10	6
104	Stone's Early	P	From Crescent x Piper, by C. C. Stone, Ill	healthy	M to L	7	8
105	Springdale	S	From Aroma, by Dr. Stayman	very healthy	M to L	8	7
106	Shawnee	S	From Cyclone, by Dr. Stayman	healthy	L	8	8
107	Sunrise	P	From Crescent x Sharpless, by J. Harrison, Mass	healthy	M	7	7
108	Shapless Improved	S	From Sharpless, by J. Hule, Conn	healthy	M	8	6
109	Tennessee Prolific	S	From Crescent x Sharpless, by J. C. Hodges, E. Tenn	very healthy	M	9	9
110	Thompson's No. 40	P	From mixed seed, by M. T. Thompson, Va	some rust	M	9	8
111	Timbrell	P	Chance, by H. S. Timbrell, N. Y	very healthy	M	8	6
112	Vera	P	Chance, by E. B. Stevenson	very healthy	M to S	10	9
113	Van Deman	S	From Crescent x Capt. Jack, by J. C. Bauer, Ark	h'lthy, some rust.	M	8	8
114	Victor Hugo	S	Unknown	healthy	M	8	8
115	Warfield	P	Supposed Crescent x Wilson, by B. C. Warfield, Ill	very healthy	M to L	10	9
116	Wm. Belt	S	By Wm. Belt, Ohio	some rust	M	8	9
117	Williams	S	From Sharpless, by Mr. Williams, Ont.	some rust	M	9	8
118	Woolverton	S	By J. Little, Ont	healthy	M to L	8	8
119	Weston	P	By E. A. Weston, Pa.	healthy	M	8	8
120	Westlawn	P	From Longfellow, by C. P. Bauer, Ark.	very healthy	M	9	7
121	Timbrell, No. 15	S	From Timbrell x Marshall & Brandy wine, by E. B. Stevenson	healthy	M to L	8	....
122	" 16	P	" "	healthy	M	9	....
123	" 10	P	" "	very healthy	L	8	....
124	" 18	P	" "	healthy	M	8	....
125	" 22	P	" "	healthy	M	9	....
126	Howard, No. 25	S	From Howard's No. 41 x Marshall & Brandy wine, by E. B. Stevenson.	very healthy	M	9	....
127	" 22	P	" "	healthy	M	9	....
128	Marshall, No. 40	S	From Marshall, by E. B. Stevenson	very healthy	M to L	8	....
129	" 41	S	" "	healthy	M	8	....
130	" 42	S	" "	healthy	M	8	....
131	" 43	S	" "	healthy	M to L	9	....
132	" 46	S	" "	healthy	M	8	....
133	" 49	S	" "	healthy	M	8	....
134	Own, No. 2	S	From mixed seed, by E. B. Stevenson	very healthy	M to S	9	....
135	" 10	P	" "	healthy	M	9	....
136	" 65	S	" "	very healthy	M	8	....

—*Concluded.*

Number.	Berry.								Value. Scale 1-10.		Remarks.
	Size.	Form.	Color.	Date of first bloom.	Date of first picking.	Flesh.	Flavor. (See Thomas.)	Season.	Dessert.	Market.	
				May	June						
92	M to L	C	C	14	12	F	medium ..	L	7	7	Another trial.
93	M	C	DR	10	12	F	good	M	6	8	
94	M	C	BR	9	5	F	medium ..	E	8	8	A good one.
95	M	R	DS	.....	.....	F	good	M	6	7	Not very valuable.
96	V L	RC	BC	13	12	F	good	M	8	9	Well worth a trial by all.
97	M to L	R	BR	.....	6	M	good	E	7	8	Worth a trial.
98	M	RC	DC	5	1	F	fair	E	8	9	A good one.
99	M to L	R	LS	8	6	M	good	E	8	9	A good early.
100	L	RC	BC	21	14	F	good	M to L	9	9	One of best.
101	M	C	LS	.....	3	F	very good.	E to M	7	8	Good market.
102	M	C	DR	.....	5	F	medium ..	E to M	7	7	Not valuable.
103	M	R	BR	16	11	F	good	M	6	6	Another trial.
104	S	C	S	6	5	M	medium ..	E	8	6	Not valuable.
105	M to L	R	BS	.....	.....	M	fair	M	7	7	Another trial.
106	M to L	C	BR	.....	.....	M	fair	M	7	7	Further trial.
107	M	RC	BC	.....	9	M	good	M	8	7	Another trial.
108	M	RC	BS	10	8	F	fair	M	8	6	Not as good as Sharpless.
109	M to L	RC	BS	12	9	F	medium .	M	7	9	A good one.
110	M	BC	S	18	10	M	good	M	6	8	Worth a trial.
111	M to L	RC	BR	11	10	VF	fair	L	10	8	A good one.
112	M to L	RC	BR	14	5	F	best	M to L	9	9	A good one.
113	M to L	RC	BC	5	M'y30	VF	good	E	10	9	One of best earlies.
114	M	C	BR	18	....	M	best.....	E to M	8	8	Worth a trial.
115	M	C	DC	6	June1	F	fair	E to M	8	9	One of best.
116	V L	BC	BR	12	12	F	good	M to L	10	9	Worth a trial.
117	L	RC	DR	24	14	F	b quality.	M	6	8	Not as good as Saunders.
118	V L	BC	DR	8	9	F	medium .	L	9	8	A good one for late.
119	M to L	BC	BR	20	10	F	good	L	9	8	A good one.
120	M to L	LC	DS	14	12	F	good	L	8	7	Further trial.
121	L	RC	C	13	13	VF	fair	M to L	....	....	
122	V L	R	C	13	13	F	fine ...	M to L	....	....	
123	L	RC	DR	10	8	VF	good acid.	M	....	....	
124	V L	R	C	13	13	F	very good	M to L	....	....	
125	L	BC	C	17	18	F	good	VL	....	...	Good bunch of fruit.
126	L	LC	C	14	13	F	good	L	....	....	
127	L	RC	C	13	13	F	very good.	L	....	....	Beautiful green calyx.
128	V L	R	BR	8	9	VF	best.....	M	....	....	Very large foliage, a fine one.
129	M to L	C	BC	8	6	F	fine flavor.	M	....	....	Perfectly white inside.
130	L	RC	BC	7	6	VF	best	E to M	....	...	A beautiful berry.
131	L	BC	C	12	8	F	good	M	....	....	A good one.
132	M	BC	DR	13	11	F	good	L to M	....	..	
133	L	R	BR	12	11	F	fine	M	....	....	
134	L	R	BR	7	8	F	good	M	....	....	A fine berry.
135	L	RC	BS	7	8	F	acid.....	M	....	..	
136	L	OB	C	18	18	F	fine . ..	VL	....	....	A good one.

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS.

Values for apples given by Station 9, except where otherwise noted by station numbered in brackets.

Varieties tested.	Season of use.	Tree.				Fruit.					Adaptation to Province.								
						Quality, Scale 1-10.		Value, Scale 1-10.			Southern. Stations 1, 2, 3, 4 and 13.			Middle. Stations 5, 6, 8 and 9.			Northern. Stations 7 and 10.		
		Vigor, Scale 1-10.	Hardiness, Scale 1-10.	Productiveness, Scale 1-10.	Total value of tree.	Dessert.	Cooking.	Home market.	Foreign market.	Total value of fruit.	Vigor.	Hardiness.	Productiveness.	Vigor.	Hardiness.	Productiveness.	Vigor.	Hardiness.	Productiveness.
APPLES.																			
Albury	Aug.-Sept	8	10	6	24	6	6	4	.....	16	.....	.....	.....	.....	.....	.....	.....	.....	.....
Alexander	Aug.-Oct	10	10	8	28	4	9	9	9	31	.....	.....	.....	.....	.....	.....	8	10	6 (10)
American Golden Russet	Jan.-May	8	10	6	24	8	8	7	9	32	.....	.....	.....	.....	.....	.....	8	9	8 (7)
Bailey Sweet	Nov.-Mar	6	8	8	22	4	8	4	4	20	.....	.....	.....	.....	.....	.....	.....	.....	.....
Baldwin	Jan.-Mar	6	7	8	21	4	6	8	8	26	.....	.....	.....	.....	.....	.....	.....	.....	.....
Beauty of Kent	Oct.-Nov	10	10	8	28	4	6	8	8	26	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ben Davis	Mar.-May	8	10	10	28	4	6	6	9	25	.....	.....	.....	.....	.....	.....	8	9	10 (7)
Benoni	July-Sept	8	10	8	26	10	8	4	7	29	.....	.....	.....	.....	.....	.....	.....	.....	.....
Blenheim Pippin	Nov.-Mar	10	10	10	30	6	7	9	9	31	.....	.....	.....	.....	.....	.....	.....	.....	.....
Blue Pearmain (8)	Oct.-Feb	8	8	7	23	8	7	8	9	32	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bogdanoff (7)	Oct.-April	10	10	8	28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bonum	Dec.-Feb	8	10	10	28	8	8	7	7	30	.....	.....	.....	.....	.....	.....	.....	.....	.....
Boston Star (8)	Oct.-Dec	9	10	10	29	6	9	7	8	30	.....	.....	.....	.....	.....	.....	.....	.....	.....
Brockville Beauty (10)	Aug.-Sept	7	8	10	25	9	9	7	.....	25	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cabashea	Dec.-Feb	10	10	5	25	2	6	6	6	20	.....	.....	.....	.....	.....	.....	.....	.....	.....
Canada Red	Dec.-Mar	8	9	10	27	6	8	8	.....	22	.....	.....	.....	.....	.....	.....	9	9	7 (10)
Chenango Strawberry (8)	Sept.-Oct	6	7	7	20	9	7	7	.....	23	.....	.....	.....	.....	.....	.....	.....	.....	.....
Colvert (7)	Oct -Jan	9	10	9	28	5	9	9	8	31	.....	.....	.....	.....	.....	.....	.....	.....	.....
Duchess	Aug.-Sept	10	10	10	30	6	9	10	9	34	.....	.....	.....	.....	.....	.....	9	10	10
Early Harvest (8)	July	6	7	8	21	9	8	6	.....	23	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fallawater	Jan.-Mar	10	10	5	25	6	8	8	9	31	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fall Pippin	Oct.-Dec	10	10	8	28	6	10	6	6	28	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fall Queen (Haas)	Sept.-Nov	8	8	8	24	5	6	6	6	23	.....	.....	.....	.....	.....	.....	10	10	10 (7)
Fameuse	Sept.-Dec	8	8	10	26	10	8	10	8	36	.....	.....	.....	.....	.....	.....	8	8	10
Gideon (7)	Oct.-Dec	10	10	10	30	8	9	10	8	35	.....	.....	.....	.....	.....	.....	10	10	10 (7)
Golden Sweet	Aug.-Sept	10	10	10	30	2	4	1	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....
Golden White	Aug.-Sept	10	10	10	30	6	8	8	.....	22	.....	.....	.....	.....	.....	.....	.....	.....	.....

Grand Sultan	Aug.-Sept.	10	10	8	28	5	8	6	6	25										
Gravenstein	Aug.-Oct	10	10	10	30	10	10	10	10	40										
Grimes' Golden	Oct.-Mar	7	5	8	20	9	4	6	7	26							7	5	8 (7)	
Hare Pipka (7)	Sept.-Oct	10	10	9	29	5	8	8	7	28										
Hastings	Jan.-Feb	8	9	8	25	8	7	7	6	28										
Hawthornden (new)	Oct.-Dec	8	8	8	24	7	7	8	8	30										
Hawthornden (old)	Sept.-Nov	7	8	8	23	5	7	5	7	24										
Highland Beauty	Jan.-Mar	6	9	8	23	9	7	7	7	30										
Holland Pippin (8)	Aug.-Oct	8	8	7	23	6	7	6	5	24										
Horn	Dec.-Mar	8	10	10	28	8	7	7	7	29										
Hubbardston's Nonsuch	Dec.-Mar	8	10	9	27	6	7	8	8	29										
Hurlbut	Dec.-Feb	7	9	7	23	8	8	8	8	32							8	9	8 (7)	
Jonathan	Dec.-Mar	8	8	9	25	10	7	8	9	34										
Kean's Seedling (7)	Sept.-Nov	10	10	10	30	7	10	9	7	33										
Kentish Fillbasket (8)	Oct.-Jan	9	9	8	26	4	9	7		20										
King of Tompkin's Co (7)	Oct.-Mar	7	5	5	17	9	9	10	10	38							7	5	8 (7)	
Lady	Jan.-Mar	7	8	9	24	9		1	2	12										
La Rue (Baxter)	Oct.-Dec	10	8	6	24		7	7	6	20							8	10	5 (7)	
Lord Burleigh	Jan.-May	10	9	9	28	8	10	8	8	34										
Lord Suffield	Aug.-Sept	6	8	9	23	4	7	5	5	21										
Lowell Pippin (5)	September	6	8	9	23	6	7	9		22										
McIntosh Red	Nov.-Mar	9	10	10	29	10	8	8	7	32										
Maiden's Blush (7)	Oct.-Dec	9	10	10	29	5	8	9	8	30							9	10	10 (7)	
Mann	Feb.-May	7	10	5	22	6	8	6	7	27							7	7	8 (7)	
Margil	Nov.-Jan	6	7	9	22	10	8	7	7	32										
Minkler	Jan.-April	9	10	8	27	6	7	8	8	29										
Mother	Nov.-Jan	5	7	7	19	10	8	7	7	32										
Mountain Beet	Sept.-Oct	8	9	8	25	6	6	5		17										
Mountain Tulip	Sept.-Oct	7	8	8	23	6	6	6		18										
Munson Sweet	Oct. Dec	10	10	10	30	1	3	2		6										
Northern Spy	Jan.-Mar	10	8	10	28	9	9	9	9	36							9	7	9 (7)	
Northfield Beauty	September	8	9	9	26	9	8	9		26										
Ontario	Jan.-Mar	8	9	10	27	9	9	9	9	36										
Pewaukee	Jan.-Mar	10	10	8	28	7	8	8	8	31							10	10	8	
Princess Louise (8)	Dec.-Feb	6	7	9	22	8	6	8	9											
Plumb's Cider	Oct.-Dec	8	9	10	27	4	4	4		12										
Rambo	Oct.-Jan	9	10	10	29	5	5	5		15										
Rawle's Janet	Feb.-June	6	9	10	25	5	4	5	5	19										
Red Astracan (7)	Aug.-Sept	9	10	8	27	8	8	7	1	24										
Rhode Island Greening	Jan.-Mar	8	8	10	26	8	10	8	8	34							7	5	10	
Ribston Pippin	Nov.-Mar	7	7	6	20	10	8	9	10	37										
Roxbury Russet	Jan.-May	7	7	8	22	6	7	8	8	29										
Salome (8)	Jan.-May	8	9	7	24	9	6	8	10	33										
Scarlet Pippin	Sept.-Dec	9	10	10	29	10	9	10		29										
Seek-no-Farther	Oct.-Mar	9	8	8	25	7	7	9	9	32										
Sops of Wine	Aug.-Sept	8	9	7	24	4	4	4		12										
Sour Bough (5)	Aug.-Sept	10	9	8	27	2	7	8		17										
St. Lawrence (7)	Oct.-Nov	10	10	10	30	10	9	9	5	33										
Stuart's Golden	Dec.-Mar	8	9	10	27	7	6	6	6	25										
Swaar (8)	Dec.-Mar	8	8	7	23	8	7	8	9	32										
Swayzie Pomme Grise	Nov.-Jan	7	8	9	24	9	8	5		22										

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS—*Continued.*

Varieties tested.	Season of use.	Tree.				Fruit.					Adaptation to Province.								
						Quality. Scale 1-10.		Value. Scale 1-10			Southern			Middle.			Northern.		
											Stations 1, 2, 3 and 4.			Stations 5, 6, 8 and 9.			Stations 7 and 10.		
		Vigor, Scale 1-10.	Hardiness, Scale 1-10.	Productiveness, Scale 1-10.	Total value of tree.	Dessert.	Cooking.	Home market.	Foreign market.	Total value of fruit.	Vigor.	Hardiness.	Productiveness.	Vigor.	Hardiness.	Productiveness.	Vigor.	Hardiness.	Productiveness.
APPLES.—*Continued.*																			
Sweet Bough (5)	Aug.-Sept	7	9	8	24	8		5		13									
Talman Sweet (7)	Oct.-Mar	10	10	9	29	6	5	2	5	18							9	10	9 (10)
Tetofsky (7)	August	9	10	9	28	7	9	6		22									
Twenty Ounce (7)	Oct.-Jan	9	9	8	26	4	7	8	9	28									
Wealthy (7)	Sept.-Dec	9	9	10	28	8	8	9	8	33							8	9	10 (10)
Wagener (7)	Oct.-Mar	8	9	8	25	7	8	8	7	30									
Yellow Bellflower (10)	Dec.-Mar	6	8	5	19	9	8	7		24									
Yellow Transparent (7)	August	10	10	8	28	6	8	6		20									
PEARS.																			
Annanas d'Ete	Aug.-Sept	8	6	4	18	4	4	5		13									
Bartlett	September	8	6	9	23	9	9	10		28	8	7	10						
Belle Lucrative	Sept.-Oct	8	8	8	24	8	8	8		24	7	9	7						
Beurre Clairgeau	Nov.-Dec	8	6	8	22	4	6	8		18							8	5	7
Beurre d'Anjou	Nov.-Jan	10	10	6	26	8	8	10		26	10	10	7						
Beurre Antoine	September	7	7	7	21	8	4	6	7	25									
Beurre Gris d'Hiver	March	10	10	8	28	4	4	4		12									
Beurre Hardy	Sept.-Oct	10	10	10	30	8	8	9		25									
Beurre Superfine	October	7	8	8	23	8	4	6	8	24									
Brockworth Park	Oct.-Jan	8	8	7	23	7	6	6	9	28									
Buffum	October	10	10	10	30	4	4	4		12									
Clapp's Favorite	Aug.-Sept	10	8	10	28	8	8	9		25	10	9	8						
Doyenne Boussock	Sept.-Oct	10	10	10	30	8	9	9		26									
Doyenne d'été	July.-Aug	8	7	8	23	8		8		16									
Duchess d'Angoulême	October	8	8	7	23	8	8	8	9	33	9	9	9						
Flemish Beauty	September	9	9	8	26	8	9	7	7	31	10	10	9				9	9	8
General Todleben	Nov.-Dec	8	9	8	25	10	8	8		26									

Glout Morceau	December	8	8	6	22	8	6	8	8	30									
Goodale	October	8	8	7	23	8	7	8	9	32									
Graslin	Oct.-Nov	8	7	8	23	9	6	7	7	28									
Grey Doyenne	October	7	6	6	19	8	2	8		18									
Howell	Sept.-Oct	8	6	7	21	9		8		17									
Josephine de Malines	Dec.-Mar	8	9	9	26	10	8	8		26									
Keiffer Hybrid	Oct.-Nov	10	10	10	30	8	9	7	9	33									
King Sessing	September	8	7	6	21	8		8		16									
Lawrence	Dec.-Jan	8	10	10	28	8		8		16									
Louise Bonne	Sept.-Oct	7	8	9	24	6		8		14									
Mount Vernon	Oct.-Nov	9	10	10	29	6		5		13									
Onondaga	Sept.-Nov	9	10	10	29	5		7		12									
President Drouard	Dec.-Mar	7	9	8	24	6	8	5	8	27									
Ritson	October	9	10	8	27	8		6	8	22									
Rostiezer	Aug.-Sept	10	8	8	26	10		8		18									
Souv. du Congres	September	8	7	8	23	7	8	9		24									
Sheldon	October	9	7	7	23	10	7	8		25									
Tyson	September	7	10	8	25	9	8	8		25									
Winter Nelis	Dec.-Jan	8	10	9	27	8		7	7	22									
Winter Seckel	Jan.-Mar	6	7	6	19	7		7	6	20									

Values for pears given by station 8, except where otherwise specified.

CATALOGUE OF FRUITS.—*Continued.*

PLUMS.

Values given at Station Number 6.

Variety	Season of use.	Tree.			Total value of tree.	Quality.		Value.		Total value of fruit.
		Vigor, Scale 1-10.	Hardiness, Scale 1-10.	Productiveness, Scale 1-10.		Dessert, Scale 1-10.	Cooking, Scale 1-10.	Home market, Scale 1-10.	Foreign market, Scale 1-10.	
Bradshaw	Aug. Sept.	7	8	9	24	8	9	10	....	27
Coe's Golden Drop	Sept.-Oct	4	8	8	20	7	10	10	....	27
Columbia	September	10	8	10	28	8	9	10	....	27
Duane's Purple	August	9	8	5	22	7	7	7	....	21
Early Black Damson	August	9	10	10	29	....	7	4	....	11
General Hand	September	10	9	6	25	7	8	10	....	25
German Prune	Sept.-Oct	6	7	7	20	....	9	8	....	17
Glass Seedling	September	10	10	9	29	4	8	7	....	19
Goliath	August	8	7	8	23	6	7	7	....	20
Gueii	August	10	10	8	28	5	7	7	....	19
Howard's Favorite	Sept.-Oct	8	10	8	26	6	9	9	....	24
Imperial Gage	August	10	8	9	27	10	10	10	....	30
Ireland's Golden Gage	August	10	8	8	26	8	9	10	....	27
Jefferson	Early September	7	6	6	21	10	10	10	....	30
Lawrence's Favorite	August	10	8	8	26	10	10	7	....	27
Lombard	September	10	10	10	30	8	9	8	....	25
McLaughlin	August	8	7	6	21	10	10	9	....	29
Moore's Arctic	Early August	7	10	10	27	2	5	7	....	14
Orange	August	9	8	8	25	4	6	8	....	18
Peach	August	7	6	4	17	8	8	8	....	23
Pond's Seedling	Sept.-Oct	10	10	8	28	4	7	7	....	18
Prince of Wales	September	6	7	6	19	8	9	10	....	27
Prince's Yellow Gage	Early August	9	10	8	27	6	6	7	....	19
Quackenbos	September	10	10	9	29	4	8	7	....	19
Reine Claude de Bavay		8	7	8	23	10	10	10	....	30
Smith's Orleans	Aug.-Sept	10	10	9	29	6	9	9	....	24
St. Catherine	September	8	8	8	24	10	10	9	....	29
Washington	Aug.-Sept	9	7	8	24	10	10	10	....	30
Yellow Egg	September	8	8	6	22	....	8	10	....	18
Yellow Gage	August	6	7	8	21	7	10	7	....	24

CATALOGUE OF FRUITS.—*Continued.*

CHERRIES

Values given by Station 13, except where otherwise specified.

Variety.	Season.	Tree.			Total value of tree.	Quality.		Value.		Total value of fruit.	Adoption to province.								
											Southern.			Middle.			Northern.		
											Stations 1, 2, 3, 4 and 13.			Stations 5, 6, 8 and 9.			Stations 7 and 10.		
		Vigor, Scale 1-10.	Hardiness, Scale 1-10.	Productiveness, Scale 1-10.		Dessert, Scale 1-10.	Cooking, Scale 1-10.	Home market, Scale 1-10.	Distant market, Scale 1-10.		Vigor.	Hardiness.	Productiveness.	Vigor.	Hardiness.	Productiveness.	Vigor.	Hardiness.	Productiveness.
I. PRUNUS CERASUS (sour cherry class).																			
(a) *Kentish.*																			
Early Richmond	June 20-26..	4	10	6	20	3	9	7	7	26	4	10	6	4	10	6	....	.....	.....
Late Kentish	July 1-10...	4	10	4	18	2	7	6	6	21	.....	.....	.....	.....	.....	.....	3	8	6
Montmorency, large	July 1-10...	6	10	8	24	3	9	7	7	26	....	. ...	.....	.....	.....	.....	.....	.....	.....
(b) *Morellos.*																			
Ostheim	July 8-15...	4	10	7	21	4	8	7	7	26	4	10	7	4	10	7	3	10	6
Vladimir	July 6-10...	3	10	3	16	.....	3	2	2	7	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wragg	July 8-16...	5	10	8	....	.....	.....	.....	....	....	.....	.....	.....	.....	....	.....	.....	.....	.....
II. PRUNUS AVIUM (sweet cherry class)																			
(a) *Mazzards.*																			
Black Mazzard	July 1-10...	10	10	4	24	.....	2	2	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....
(b) *Hearts.*																			
Black Eagle	June 20-30..	6	10	4	20	10	4	7	4	25	6	10	4	6	4	4	.....	.....	.....
Black Tartarian	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	...	... ..	.....	.....	.....	.....
Coe's Transparent	June 15-20..	10	10	5	25	7	6	6	2	21	.. ...	.....	.....	.....	.....	.....	.....	.....	.....
Early Purple	June 10-15..	8	10	8	26	8	2	8	8	26	8	10	8	7	9	5	....	.....	.....
Governor Wood	June 15-20..	8	10	9	27	8	7	7	4	26	.....	.....	.....	.....	.....	.....	.....	.....	....
(c) *Bigarreaus.*																			
Monstreuse de Mezel	June 25-30..	10	10	9	29	8	7	10	10	35	.....	.....	.....	.....	.....	.....	... ..	.....	.....
Napoleon Bigarreau	July 1-6....	9	10	10	29	7	8	9	9	33	....	.....	.....	.....	.. ...	....	.....	.....	.....
Yellow Spanish	June 25-30..	10	10	6	26	8	8	8	8	32	.....	.....	....	.....	... ..	.....	.....	.....	.....
(d) *Dukes.*																			
May Duke.	June 12-20..	9	10	6	25	7	10	9	8	34	.....	.....	.....	.....	.....	.....	.....	....	.....

CATALOGUE OF FRUITS.—*Continued.*

GRAPES.

Values assigned at Station No. 3.

Variety.	Season of use.	Vine.				Total value of vine.	Value.		Total value of fruit.
		Vigor, Scale 1-10.	Hardiness, Scale 1-10.	Productiveness, Scale 1-10.	Freedom from disease, Scale 1-10.		Dessert, Scale 1-10.	Market, Scale 1-10.	
Adirondac	Sept	3	2	2	2	9	9	2	11
Alvey (Hagar)	Oct.	7	8	6	8	29	2	2	4
Agawam (Rog. 15)	Oct. Nov.	9	9	8	4	30	9	9	18
Amber	Oct.	6	6	3	4	19	2	2	4
Amber Queen	Oct. Nov.	7	6	5	6	24	6	5	11
August Giant	Sept	8	8	7	8	31	5	5	10
Barry (Rog. (43)	Oct.	9	9	8	7	33	7	7	14
Black Pearl	Sept	9	9	9	9	36	2	2	4
Brighton	Sept	8	10	7	6	31	8	7	15
Catawba	Oct. Nov.	8	10	8	5	31	10	10	20
Concord	Sept. Oct.	10	10	10	9	39	6	10	16
Cottage	Sept	6	8	3	8	25	4	4	8
Creveling	Sept	10	10	6	6	32	6	4	10
Delaware	Sept	5	8	8	6	27	10	10	20
Diana	Oct.	9	9	7	6	31	6	6	12
Dracut Amber	Sept	6	9	7	6	28	2	4	6
Duchess	Oct.	6	5	6	8	25	5	6	11
Eldorado	Sept	8	8	6	7	29	9	6	15
Empire State	Sept	7	8	4	7	26	4	4	8
Eumelan	Sept	6	7	6	7	26	7	5	12
Goethe (Rog. No. 1)	Oct.	9	9	8	8	34	4	7	11
Jefferson	Oct. Nov.	4	5	5	7	21	6	6	12
Lady	Sept	2	10	2	6	20	8	8	16
Lady Washington	Oct.	9	9	7	5	30	4	4	8
Lindley (Rog. 9)	Sept.	9	10	8	8	35	9	9	18
Marion	Oct.	9	9	7	7	32	2	2	4
Martha	Sept	4	6	4	6	20	7	4	11
Massasoit (Rog. 3)	Sept	10	9	6	6	31	8	7	15
Missouri Riesling	Oct.	7	8	7	5	27	4	3	7
Moore's Diamond	Sept	6	8	6	7	27	7	7	14
Moore's Early	Sept	5	9	4	9	27	7	8	15
Noah	Oct	9	9	10	5	33	2	3	5
Perkins	Sept	8	8	7	7	30	3	5	8
Pocklington	Oct	5	8	6	8	27	7	6	13
Prentiss	Oct	6	7	6	6	25	5	5	10
Rebecca	Sept	3	4	3	3	13	8	5	13
Requa (Rog. 28)	Sept	10	8	8	7	33	8	8	16
Salem	Sept	10	8	8	6	32	8	9	17
Taylor	Oct	9	9	3	7	28	2	2	4
Vergennes	Oct. Nov.	7	7	6	7	27	6	8	14
Wilder	Sept	7	9	7	7	30	7	8	15
Worden	Sept	7	10	7	8	32	9	8	17
Wyoming Red	Sept	8	8	7	8	31	4	6	10

CATALOGUE OF FRUITS.—*Concluded.*

BLACKBERRIES.

Values assigned at Station No. 4.

Variety.	Season.	Plant.				Total value of plant.	Fruit.		Total value of fruit.
		Vigor, Scale 1-10.	Hardiness, Scale 1-10.	Productiveness, Scale 1-10	Freedom from disease, Scale 1-10.		Dessert, Scale 1-10.	Market, Scale 1-10.	
Agawam	Medium	8	10	7	9	34	5	6	11
Early Cluster	Late	8	10	3	9	30	5	5	10
Early Harvest	Late	8	6	4	9	27	1	8	4
Erie	Medium	7	10	8	9	34	7	8	15
Gainor	Early	8	10	8	9	35	9	9	18
Kittatinny	Late	8	9	10	9	36	10	10	20
Lovett's Best	Medium	9	10	5	9	33	5	4	9
Maxwell	Medium	5	10	8	9	32	5	8	13
Ohmer	Medium	8	10	8	10	36	8	8	16
Snider	Medium	9	10	9	10	38	8	8	16
Stone's Hardy	Medium	8	9	8	9	34	8	8	16
Taylor	Medium	7	10	9	9	35	9	7	16
Wachusetts	Medium	8	10	8	9	35	9	7	16
Western Triumph	Medium	10	10	9	10	39	9	9	18

RASPBERRIES.

Values assigned at Station No. 4.

All-Summer	July Oct	6	10	8	9	33	8	8	16
Columbian	Medium	10	10	10	10	40	7	8	15
Cuthbert	Medium late	9	9	9	8	35	10	10	20
Golden Queen	Medium	8	7	8	9	32	9	9	18
Gregg	Late	7	8	8	4	27	5	8	13
Hilborn	Early	9	10	10	10	39	9	8	17
Kansas	Early	10	10	10	10	40	10	10	20
Lovett	Medium	8	10	8	9	35	6	8	14
Marlboro'	Early	8	10	8	10	36	7	10	17
Older	Early	9	9	7	10	35	4	9	13
Palmer	Early	9	10	7	9	35	9	8	17
Progress	Early	8	10	5	9	32	8	8	16
Thompson	Medium	7	10	7	10	34	2	7	9
Shaffer's Colossal	Medium	10	10	10	10	40	5	8	13

APPENDIX.

REPORT OF THE SUPERINTENDENT OF EXPERIMENTAL SPRAYING.

To the Honorable the Minister of Agriculture for Ontario :

SIR,—The report of the experimental spraying in Ontario in 1896, which I now have the honor of laying before you, has been carefully prepared from notes made by the several experimenters as the work was being done, and from information gathered and observations made, at my inspection of the orchards in September and October.

The past season has given the most abundant and the best crop of apples that Ontario has ever produced. Insects attacking the fruit, and fungus, have been remarkably scarce this year, the former owing probably to the severe frost of June, 1895, which destroyed the apple crop and so interfered with the propagation of these insects, and the latter owing to the seasons being unusually dry.

In many sections where heretofore the crop has been almost totally ruined by codling moth and scab, they have this year been comparatively free from them.

However at St. Catharines and Waterloo where the scab was bad, excellent results were obtained.

I do not consider that in either of those orchards, or in any in fact, the maximum results were obtained. The work was entered upon much too late in the spring as at many points the leaves were from one-half to three fourths grown, and the fruit buds were advanced far enough to show color ; which made it impossible to reach all the branches and twigs with the mixture as should be done to kill the spores of the scab. In fact the first application was made at the time the second should have been made.

Another cause which lessens the results is that the work must be done on the day set, even if the wind be high or there is an appearance of rain. Many applications were wholly or partially lost in this way.

Again, experiments are made in orchards which have never been sprayed before, or if they have been sprayed the work has only been indifferently done.

It would be interesting and instructive to have work conducted at a few points for several consecutive years and to note the results.

Insects attacking the buds and foliage, such as bud worm, tent caterpillar, canker worm, etc., have been plentiful and found at almost every point visited. These, of course, have been easily controlled and the result has been decidedly larger and better fruit on trees on which the foliage was preserved from their attacks.

When tent caterpillars and canker worms are allowed to defoliate a fruit tree, the tax on the tree of reproducing its foliage is so great that the crop will be lost and the tree so injured that it will bear little, if any, fruit the following year. I know of one case of a fine orchard, which was totally destroyed, the trees dying, from being defoliated year after year by these pests.

It is unjust that painstaking, enterprising fruit growers, should be left at the mercy of careless and lazy neighbors in this matter. The presence of these insects in an orchard is easy to detect, and their destruction is also easy and inexpensive, so that it would be no hardship to anyone and a great boon to many were the Government to enforce their destruction under a penalty.

Experiments were conducted at twenty-nine points, covering the Province from London to Winchester. This territory was divided into three districts, Mr. A. W. Muir taking the western division, Mr. C. F. Mabey, the central, and Mr. W. F. Randall, the eastern. They started on their trips on April 27th, 25th and 27th, respectively, and covered their districts about every twelve days during the season until each orchard had been visited six times. I visited each of the agents at several sprayings during the season and found them doing the work in a satisfactory manner.

Great interest was shown in the work, and although the results were not what they would have been under more favorable circumstances, still the educational value of the work was very great, more than 1,900 people witnessing the preparation and application of the mixtures.

In a number of cases people drove twenty and twenty-five miles to see work performed, and many requested to that experiments be conducted in their locality.

Spraying outfits were furnished by the Spramotor Co., of London, Ont., and The Aylmer Iron Works Co., of Aylmer, Ont., and gave entire satisfaction.

Canadian pump manufacturers are now turning out spraying pumps equal to the best made in any part of America.

I have the honor to be, Sir,

Your obedient servant,

W. M. ORR.

ST. CATHARINES, LINCOLN CO.—MR. A. PAY'S ORCHARD.

1st application, April 25th.—Fine and warm. Buds well advanced. Leaves half grown. Used Bordeaux and Paris green, bud moth quite plentiful.

2nd application, May 6th.—Fine and warm. Blossoms just opening. Used Bordeaux. Could not find any bud moth, but could see plainly where they have been working.

3rd application, May 19th.—Fine but windy. Used Bordeaux and Paris green. Found a few tent caterpillars and canker worms. About 50 per cent. of blossoms have set.

4th application, May 30th.—Fine. Used Bordeaux and Paris green. Found a few canker worms. Trees and foliage are in fine condition. There will be a full crop here.

5th application, June 10th.—Fine and warm. Used Bordeaux and Paris green. Found some bark louse.

6th application, June 25th.—Fine and warm. Rain in the evening. Used Bordeaux and Paris green.

The following varieties were experimented upon: King, Greening, Russett, Baldwin and Spy. This orchard is fairly well pruned. About half is cultivated, the remainder is in sod, but will be plowed this year.

I inspected this orchard September 23rd.

Mr. Pay has two orchards side by side. One was sprayed and one was not. The balance of the orchard in which experiments were conducted was sprayed three times. Neither of the orchards had ever been sprayed before, and Mr. Pay says that in former years more than half of the crop had been wormy or spotted.

The following results were obtained:

In Fall Pippins, which had been sprayed, five barrels of bright clean fruit, free from worms, and less than half a bushel of culls, rejected for size, were taken from one tree.

In Fall Pippins which had not been sprayed, from one tree three barrels of fruit were packed. These were not so bright or free from spot as the No. 1 sprayed, and two barrels were culled for worm and spot.

In Greenings, which had been sprayed, five men packed 125 barrels in a day, and there were less than five barrels of culls. These culls were not spotted or wormy, but undersize. This lot of fruit sold in Glasgow on October 9th at eleven shillings per barrel, the consignee writing that they were very fine.

In Greenings, which had not been sprayed, the same gang did not pack more than half as many barrels in a day, although they handled as many apples, so many having to be rejected as imperfect.

In Snow apples the result was very marked. Three trees which were sprayed three times gave eighteen barrels of beautiful fruit free from worm or spot.

Mr. Pay says that these trees have borne crops for seven or eight years, but that they have never been fit to pack before. He also considers that the foliage on the sprayed trees appears more healthy than that on the unsprayed trees.

Stoney Creek, Wentworth Co.—Mr. Robt. Granger's Orchard.

1st application, April 27th.—Rain about two hours after spraying. Buds advanced. Leaf about a quarter grown. Used Bordeaux mixture. Orchard was pruned this year.

2nd application, May 7th.—Fine and warm. Used Bordeaux and Paris green. Trees are showing a moderate bloom, which is just opening.

3rd application, May 20th —Cloudy. Used Bordeaux and Paris green. Canker worm very bad. From thirty per cent. to forty per cent. of blossoms have set.

4th application, June 1st.—Fine and warm. Used Bordeaux and Paris green. There will be a full crop here.

5th application, June 11th.—Fine but windy. Used Bordeaux and Paris green. Bark louse plentiful. Foliage on sprayed trees looks well.

6th application, June 26th.—Fine and warm. Used Bordeaux and Paris green. There is a noticeable difference in sprayed and unsprayed foliage.

I inspected Mr. Granger's orchard and found sprayed trees of all kinds showing better fruit and foliage than unsprayed trees. In the Spy, sprayed trees will yield more than double the quantity that unsprayed trees will, and the fruit is larger and cleaner.

Burlington, Halton Co.—Capt. D. Henderson's Orchard

1st application, April 28th.—Fine and warm. Buds well advanced. Leaf one-quarter grown. Used Bordeaux and Paris green. Some bud moth.

2nd Application, May 8th.—Fine but windy. Buds just opening. Used Bordeaux and Paris green. Bud moth and tent caterpillar quite numerous.

3rd application, May 21st —Fine and warm. Used Bordeaux and Paris green. Canker worm and leaf crumpler plentiful. A moderate crop of fruit has set.

4th application, June 2nd.—Fine and warm. Used Bordeaux and Paris green.

5th application, June 12th.—Fine and warm. Used Bordeaux and Paris green. Bark louse quite plentiful.

6th application, June 27th.—Fine and warm. Used Bordeaux and Paris green.

I inspected this orchard September 25th. It is well pruned and cultivated. Very little scab in this orchard. Fruit on sprayed trees was free from worms, while fruit on unsprayed trees was wormy and dropping.

St. George, Brant Co.—Mr. Jos. Van Atter's Orchard.

1st application, April 29th.—Fine and very windy. Buds advanced. Leaf one quarter grown. Used Bordeaux and Paris green. Bud moth plentiful. Some bark louse.

2nd application, May 9th.—Fine and warm. Used Bordeaux and Paris green. Bud moth and tent caterpillar numerous, especially on unsprayed trees.

3rd application, May 22nd.—Fine and very windy. Used Bordeaux and Paris green. Bud moth and canker worm still bad on unsprayed trees.

4th application, June 3rd.—Fine and warm. Used Bordeaux and Paris green. About eighty-five per cent. of fruit has set.

5th application, June 13th.—Fine and warm. Used Bordeaux and Paris green.

6th application, June 29th. —Fine and warm. Used Bordeaux and Paris green.

Inspected Mr. Van Atter's orchard September 22nd. This is the first spraying it has had. It is kept in sod and bears well. The foliage and fruit on sprayed trees were free from fungus or worms, while on unsprayed trees there was considerable of both. Sprayed harvest apples did not crack as they usually do.

Drumbo, Oxford Co.—Mr. Muma's Orchard.

1st application. April 30th.—Light rain two hours after spraying. Buds advanced. Leaf about one quarter grown. Used Bordeaux and Paris green. Some bud moth.

2nd application, May 11th. —Fine and warm. Used Bordeaux and Paris green. Tent caterpillar quite numerous.

3rd application, May 23rd.—Fine but very windy. Used Bordeaux and Paris green. A few canker worm here. There will be a good crop of apples.

4th application, June 4th.—Cloudy. Used Bordeaux and Paris green.

5th application, June 15th.—Fine and warm. Used Bordeaux and Paris green. Shower about three hours after spraying. Bark louse plentiful.

6th application, June 30th.—Fine and warm. Used Bordeaux and Paris green.

I inspected this orchard September 21st. The trees stand in sod, are well pruned and trunks scraped. Sprayed Spys bore forty per cent. more fruit than unsprayed Spys, and the fruit was much larger and fifty per cent. cleaner.

On Snow trees sprayed ninety-five per cent. of fruit was clean, while on unsprayed Snow trees only four per cent. was clean. Mr. Muma says this is the first crop of clean Snows for six years.

Galt, Waterloo Co.—Mr. J. M. Robertson's Orchard.

1st application, May 1st.—Fine and warm. Fruit buds advanced. Leaf about one-third grown. Used Bordeaux mixture. A few bud moth here.

2nd application, May 12th.—Fine and cool. Blossoms fully open. Used Bordeaux mixture. A few tent caterpillars and bud moth. Bark louse very plentiful.

3rd application, May 26th.—Fine but windy. Used Bordeaux and Paris green. Tent caterpillar and canker worm very bad. This is the first time Paris green has been used here.

4th application, June 5th.—Showers in evening. Used Bordeaux and Paris green. A full crop of fruit has set.

5th application, June 16th.—Fair and warm. Used Bordeaux and Paris green.

6th application, July 2nd.—Fine and warm. Used Bordeaux and Paris green.

I inspected this orchard on September 19th. The trees stand in sod, are in splendid condition and bear regularly. It has never been sprayed before. The fruit on the sprayed trees is larger and the foliage much better than on the unsprayed trees. Not much scab in orchard, except on Snows. By actual count, ninety per cent. of sprayed Snows and only ten per cent. of unsprayed Snows were clean. Mr. Robertson says this is the first crop of clean Snows in four years. He says he will continue spraying.

Waterloo, Waterloo Co.—Mr. Jacob B. Shantz's Orchard.

1st application May 2nd.—Cloudy and rain in afternoon. Buds well advanced. Leaves half grown. Used Bordeaux and Paris green.

2nd application, May 13th.—Fine and warm. Blossoms are beginning to fall. Used Bordeaux and Paris green. Orchard showing a moderate bloom. A few bud moths on sprayed trees, but less than on unsprayed trees. Canker worm and tent caterpillar plentiful. Trees infested with bark louse.

3rd application, May 27th.—Fine and warm. Light shower just as work was finished. Used Bordeaux and Paris green. About fifty per cent. of the blossoms have set.

4th application, June 6th.—Fine and warm. Used Bordeaux and Paris green. Very few canker worms to be found; none on sprayed trees. No signs of codling moth. This orchard will have ninety per cent. of a crop.

5th application, June 17th.—Fine and warm. Used Bordeaux and Paris green.

6th application, July 3rd,—Fine and very hot. Used Bordeaux and Paris green. No scab on sprayed Snows; other Snows very bad.

The following varieties were experimented upon: Spy, Ribstone, Greening, Russett, Snow, Swaar, Baldwin and Newton Pippin. This orchard is badly in need of pruning. A crop of corn was grown among the trees last yaar.

I inspected this orchard September 24th. Mr. Shantz tells me the orchard has not been sprayed before and that it bears regularly.

Results.

Snows, sprayed six times, 82 per cent. clean.

Snows, sprayed twice by Mr. Shantz, 21 per cent. clean.

Snows, unsprayed, 5 per cent. clean.

Newton Pippins, sprayed six times, 57 per cent. clean.

Newton Pippins, sprayed twice by Mr. Shantz, 50 per cent. clean.

Newton Pippins, unsprayed, 5 per cent. clean.

Swaar, sprayed six times, 68 per cent. clean.

Swaar, unsprayed, 4 per cent. clean.

The results would probably have been more marked in favor of the six applications had not the first and third applications been followed by rain within a few hours.

Brampton, Peel Co.—Mr. Frank Hillock's Orchard.

1st application, May 4th.—Windy, and a shower when work was about half done. Blossoms well advanced. Used Bordeaux mixture.

2nd application, May 14th.—Fair and warm. Used Bordeaux and Paris green. Tent caterpillar very bad. Some bud moth.

3rd application, May 23th.—Spraying postponed on account of heavy rain. However, work was done two days later by Mr. Hillock. Tent caterpillar and bark louse very bad.

4th application, June 8th.—Cloudy, with occasional light showers. Used Bordeaux and Paris green. Full crop of apples here. Heavy rain in afternoon.

5th application, June 18th.—Fine and warm. Used Bordeaux and Paris green. Unsprayed trees badly eaten by caterpillar.

6th application, July 4th.—Cloudy, with light shower about one hour after spraying.

I inspected Mr. Hillock's orchard September 26th. It is kept in sod and bears regularly. This is the first regular spraying. Scab is quite bad on nearly all varieties. Snow apples have been so badly affected for last six years as to be worthless. This year they were quite clean and other varieties were better than ever before.

Richmond Hill, York Co.—Mr. John Brown's Orchard.

1st application, May 5th.—Fine, and high wind. Blossoms almost bursting. Leaf two-thirds grown. Used Bordeaux and Paris green.

2nd application, May 15th.—Fair, but strong wind. Blossoms nearly all fallen. Used Bordeaux and Paris green. Tent caterpillar and bark louse plentiful. A few bud moth on unsprayed trees.

3rd application, May 29th.—Cloudy, with showers in afternoon. Used Bordeaux and Paris green. Sprayed trees quite free from insects. Fruit has set well.

4th application, June 9th.—Had to be passed by on account of heavy rain.

5th application, June 19th.—Fair and warm. Used Bordeaux and Paris green.

6th application, July 6th.—Cloudy, and shower when work was half finished. However, after half an hour it cleared and work was resumed. Used Bordeaux and Paris green. Foliage on sprayed trees looks somewhat better than on unsprayed trees.

I inspected Mr. Brown's orchard September 29th. It stands in sod, and bears regularly. Mr. Brown has not done any spraying, but his orchard is remarkably free from worms and scab. He, however, thinks that the English Russet is better and more free from worms than in any former year.

Dundas, Wentworth Co.—Mr. J. H. Wilson's Orchard.

1st application, April 27th.—Work interrupted when half finished by light thunder shower. Used Bordeaux and Paris green. Bark louse bad.

2nd application, May 8th.—Clear and very warm. Used Bordeaux and Paris green. A profuse showing of fruit buds except in Spys. Some bud moth and canker worm.

3rd application, May 1st.—Fine and cool. Used Bordeaux and Paris green. Trees are looking fine, and fruit has set well.

4th application, June 3rd.—Fine and warm. Used Bordeaux and Paris green. Some canker worm on unsprayed trees but sprayed trees are clear. Some tent caterpillars at work.

5th application, June 15th.—Fine and clear, with showers at night. Used Bordeaux and Paris green. Some scab showing on unsprayed trees, but could find none on sprayed trees.

6th application, June 29th.—Clear and cool. Used Bordeaux and Paris green. Spy trees not bearing; from 85 per cent. to 100 per cent. of a crop on other trees. Found a few codling moth.

I inspected this orchard September 22nd. It is cultivated and fairly well pruned. Berries are grown between the rows. The orchard is in good condition, fruit and foliage looking well. The benefit of spraying was quite noticeable on Greenings, on which sprayed fruit was eighty per cent. clean and unsprayed, thirty per cent. clean.

Brantford, Brant Co.—Mr. A. Edmondson's Orchard.

1st application, April 28th.—Clear and fine. Buds just advancing. Used Bordeaux mixture. Bud moth very bad. Some caterpillars and bark louse.

2nd application, May 9th.—Fine and very warm. Used Bordeaux and Paris green. Bloom very heavy. Bud moth and caterpillar bad. Bud moth has done a lot of damage here owing to Paris green being omitted in the first application. About twenty people were present and I had hard work to persuade them to allow me to use the Paris green but finally succeeded.

3rd application, May 22nd.—Fine and warm. Used Bordeaux and Paris green. A few caterpillar and canker worm.

4th application, June 3rd.—Clear and warm. Used Bordeaux and Paris green.

5th application, June 16th.—Rained in morning, but fine and warm in evening. Used Bordeaux and Paris green. Canker worm still at work on unsprayed trees. Leaf roller quite bad. Spot showing slightly on unsprayed trees.

6th application, June 30th.—Fine and warm. Used Bordeaux mixture and Paris green. Foliage generally good. Found a few codling moth. Spot showing on Spy and Greening, but could not find any on sprayed trees.

I inspected this orchard September 21st. It is kept in sod, fertilized with farm yard manure and bears regularly. Has not been sprayed before. Fruit on the orchard was generally good. There is only one Snow tree in the orchard. It was sprayed and gave twelve barrels of clean fruit. This is the first clean Snows Mr. Edmondson has had in four years.

Norwich, Oxford Co.—Mr. D. A. Dager's Orchard.

1st application, April 29th.—Clear and high wind. Fruit buds just showing. Used Bordeaux mixture and Paris green. Bud moth very bad and has done a lot of damage.

2nd application, May 11th.—Fine and warm. Used Bordeaux mixture and Paris green. Bloom fully open and profuse. Bud moth very bad, also canker worm and caterpillar.

3rd application, May 23rd.—Fine and high wind. Used Bordeaux and Paris green. Canker worm and tent caterpillar very bad. Sprayed trees have been damaged somewhat owing to mixture having been washed off by a heavy rain the morning after last spraying.

4th application, June 5th.—Fine and very warm. Very heavy rain the night after work was done. Used Bordeaux and Paris green. Canker worm and caterpillar very bad on unsprayed tree and a few on sprayed.

5th application, June 17th.—Fine and warm. Used Bordeaux and Paris green. Found some leaf roller.

6th application, July 2nd.—Clear and very warm. Used Bordeaux and Paris green. Saw some spot on unsprayed Harvest, Spy and Greening trees.

I inspected Mr. Dager's orchard and found the following results: Sprayed Greening gave 90 per cent., and unsprayed Greenings 26 per cent. of clean fruit. All the Spy trees that were sprayed with one exception have a heavy crop of fine fruit free from scab or worms. The unsprayed Spys were a very light crop, not so clean nor uniform in size, nor was the foliage in as good condition.

Woodstock, Oxford Co.—Mr. M. Clark's Orchard.

1st application, April 30th.—Shower three hours after work was done. Fruit buds just ready to open. Used Bordeaux mixture. Bark louse and bud moth very bad. Many were surprised when they were shown the extent of damage done by bud moth, as they did not know of it before.

2nd application, May 12th.—Fine and cool. Used Bordeaux and Paris green. Bloom profuse and fully open. Bud moth very bad, also some tent caterpillar and canker worm. Had a hard fight before being allowed to use Paris green.

3rd application, May 26th.—Clear with high wind. Used Bordeaux and Paris green.

4th application, June 6th.—Fine and warm. Used Bordeaux and Paris green. Fruit looks very clean.

5th application, June 18th.—Fine and hot. Used Bordeaux mixture and Paris green. Canker worm and leaf roller at work in unsprayed trees, none in sprayed trees.

6th application, July 3rd.—Fine and warm. Used Bordeaux and Paris green. Codling moth has been at work on unsprayed fruit. All present agreed that sprayed trees had better foliage and cleaner and larger fruit, and expressed themselves as being pleased with the results.

I inspected Mr. Clark's orchard on Sept. 16th. The orchard has not been sprayed before, and is in poor condition. I found the apple packers at work here. They say that they find much the best fruit on sprayed trees, especially among Snows, not one-quarter of which are fit to pack in unsprayed orchards. In this orchard the sprayed Snows gave 85 per cent. of fruit fit for packing, while the unsprayed gave only 20 per cent.

Ingersoll, Oxford Co.—Thomas Hayslop's Orchard.

1st application, May 1st.—Fine and warm. Fruit buds just about ready to open. Used Bordeaux and Paris green. Some bud moth here.

2nd application, May 13th.—Clear, with strong wind. Blossoms falling. Used Bordeaux and Paris green. Bud moth and tent caterpillar quite bad on unsprayed trees.

3rd application, May 27th.—Heavy shower just as work was starting; however it cleared shortly and work was proceeded with. Rained again later in the day. Used Bordeaux and Paris green.

4th application, June 28th.—Cloudy with very heavy rain just as work was finished. Used Bordeaux and Paris green. Mr. Hayslop will spray again when the weather settles. A few caterpillars on unsprayed trees.

5th application, June 19th.—Fine and warm. Used Bordeaux and Paris green.

6th application, July 4th.—Heavy rain all day so that work could not be done. However I prepared the mixture and Mr. Hayslop will apply it when it clears up.

I inspected Mr. Hayslop's orchard on September 16th. The orchard is part of young trees and part of old, and is fairly well pruned.

Fruit on Bellflower almost perfect; in previous years it gave ill-shaped, spotted and wormy fruit.

Greenings alongside sprayed three times showed considerable scab. Canada Red and Spy sprayed showed a remarkable contrast with unsprayed trees of the same varieties both in fruit and foliage.

A snow apple tree so situated that only part of it could be sprayed gave beautiful clean fruit on the sprayed side while the unsprayed side was loaded with fruit which was cracked and scabbed. Mr. Hayslop says that he has not had any clean fruit off this tree before for twelve years.

London, Middlesex Co.—Mr. R. Steven's Orchard.

1st application, May 2nd.—Fine but high wind. Used Bordeaux mixture. Leaf half grown. Fruit buds about ready to open, and some open. Foliage too far advanced to apply mixture well to limbs and twigs. It is about time when second spraying should be done. Bark louse bad and some canker worm.

2nd application, May 14th.—Clear and high wind. Used Bordeaux and Paris green. About half the bloom has fallen. Canker worm very bad, and a few bud moth and tent caterpillar here. Heavy showers in the evening. Wrote asking Mr. Stevens to repeat application.

3rd application May 28th.—Cool and very high wind. Used Bordeaux and Paris green. Some caterpillar at work. Orchard was not sprayed after rain following second spraying.

4th application June 9th.—Cloudy, with a light sprinkle at night and rain next day. Used Bordeaux and Paris green. Canker worm and caterpillar still at work, but only a few on sprayed trees. Scab showing quite bad.

5th application, June 20th.—Fine and very hot, with a shower next day. Used Bordeaux and Paris green. A few codling moth. Scab very bad here. Some on sprayed trees.

6th application, July 6th.—Cloudy and high wind. Used Bordeaux and Paris green. Scab very bad. Some codling moth.

I inspected Mr. Stevens' orchard Sept. 29th. It is in very good condition and well pruned. Snow apples which were sprayed were almost perfect, while those which were not were badly scabbed and wormed. Canada Red trees sprayed showed good foliage and a fine crop of clean fruit, while on unsprayed trees of the same variety the foliage was in bad condition and the fruit almost worthless from scab and worm. All varieties experimented upon, including Alexander, Baldwin, Wine, Canada Red, Greening, Spy, Snow and Harvest, were decidedly better where sprayed.

Results were not as great here as they would have been owing to first application being made much too late, and also to second and third applications having been followed by heavy rains.

St. Marys, Perth Co.—Mr. John Legge's Orchard.

1st application, May 4th.—Fine and very high wind. Very much advanced, fruit buds showing color. Used Bordeaux mixture and Paris green. Trees very small for their age and badly in need of pruning. A poor orchard for a fair test. It stands on the north side of a hill in a tough, old sod. Bark louse very bad, and a great many bud moth and tent caterpillar.

2nd application, May 15th.—Cool and high wind. Used Bordeaux and Paris green. Bud moth and caterpillar at work on unsprayed trees. Sprayed trees fairly clean.

3rd application, May 29th.—Cold and heavy wind storm. Used Bordeaux and Paris green. Wind was so high trees could only be sprayed on one side, and that unevenly.

4th application, June 10th.—Clear and high wind. Used Bordeaux mixture and Paris green. Canker worm attacking unsprayed trees.

5th application, June 22nd.—Clear, with high wind. Used Bordeaux and Paris green. Foliage good. Scab showing on unsprayed trees. Sprayed trees clean.

6th application, July 7th.—Clear and high wind. Used Bordeaux and Paris green. A few codling moth found, but only on unsprayed fruit.

I inspected this orchard September 17th. A noticeable difference in Snow, Duchess and Russett, sprayed and unsprayed. Seventy-five per cent. of sprayed Snows were perfect, and twenty per cent. of unsprayed, with advantage in size of fruit and in foliage for sprayed trees.

Stratford, Perth Co.—Mr. S. J. Monteith's Orchard.

1st application, May 5th.—Fine and warm. Used Bordeaux mixture. Leaf one-third grown. Fruit buds showing color. Some bud moth and bark louse, and a lot of caterpillar nests here.

2nd application, May 16th.—Fine and warm. Used Bordeaux and Paris green. Bud moth still at work. Lots of tent caterpillar and canker worm.

3rd application, May 30th.—Cloudy and cool. Used Bordeaux and Paris green. Fruit well set and foliage good on sprayed trees. A few caterpillar and canker worm still at work on unsprayed trees.

4th application, June 11th.—Clear and fine. Used Bordeaux mixture and Paris green. No scab yet.

5th application, June 24th.—Clear and high wind. Used Bordeaux and Paris green. A little scab showing on unsprayed fruit.

6th application, July 8th.—Fine and warm. Used Bordeaux mixture and Paris green. Found a few codling moth in unsprayed fruit. People here well satisfied with experiment.

I inspected Mr. Monteith's orchard on September 17th. First year of spraying. Orchard cultivated and in very good condition. Not much scab, except on unsprayed Snow apples, which were scabbed and wormy. All sprayed trees are showing fine fruit and foliage.

Durham, Grey Co.—Mr. David Jackson's Orchard.

1st application, May 6th.—Fine and warm. Used Bordeaux and Paris green. Fruit buds just showing. Bark louse bad, and some bud moth and caterpillar nests.

2nd application, May 18th.—Fine and high wind. Used Bordeaux and Paris green. Blossoms about all fallen.

3rd application, June 1st.—Clear and very cool. Used Bordeaux and Paris green. Caterpillar is working on unsprayed trees.

4th application, June 12th.—Fine and warm. Used Bordeaux and Paris green. A few canker worm and leaf roller at work in orchard. A little scab appearing on unsprayed trees.

5th application, June 25th.—Clear and warm. Used Bordeaux and Paris green. No scab on sprayed fruit.

6th application, July 19th.—High wind and showers in evening, with prospect of a rain. Used Bordeaux and Paris green. Foliage very fair on most trees. Codling moth very scarce.

I inspected this orchard September 18th. The orchard stands in an old sod and needs pruning. It bears regularly. Snow apples which were experimented upon were free from scab and worm for first time in twelve years. The same is true of Strawberry Pippin, and all varieties show larger and better fruit on sprayed trees. Mr. Jackson says that the question of controlling scab on apples is settled in his mind beyond a doubt.

Fergus, Wellington Co.—Industrial Home Orchard.

1st application, May 7th.—Fine and warm. Fruit buds just showing. Used Bordeaux mixture. Some bud moth. Bark louse bad, and lots of caterpillars nests.

2nd application. May 19th.—Mild and clear. Used Bordeaux and Paris green. Most of the bloom has fallen. Caterpillar quite bad.

3rd application, June 2nd.—Warm and high wind. Used Bordeaux and Paris green. A few canker worm here.

4th application, June 13th.—Clear and warm. Used Bordeaux and Paris green. Foliage in good condition.

5th application, June 26th.—Clear and high wind, so that spraying could only be done from one side. Used Bordeaux mixture and Paris green. Scab showing a little on some trees, but did not see any on sprayed trees.

6th application, July 10th.—Cloudy, with high wind and mist, also light rain at times. Used Bordeaux and Paris green. Very little codling moth.

I inspected this orchard September 18th. It is in good condition and fairly well pruned. Fruit and foliage are looking well. Very little scab on any trees. First clean Snow apples for years.

Oakville, Halton Co.—Mr A. Chisholms' Orchard.

1st application, April 27th.—Cool and cloudy, with light rain in afternoon. Leaf bud just opening. Used Bordeaux and Paris green.

2nd application May 8th.—Fine and warm. Used Bordeaux and Paris green.

3rd application, May 21st.—Fine and warm. Used Bordeaux and Paris green. About 75 per cent. of blossoms have set. This orchard is badly infested with bark lice.

4th application, June 3rd.—Fine and warm. Used Bordeaux and Paris green. Foliage looking well and free from injurious insects.

5th application, June 15th.—Fine and warm. Used Bordeaux and Paris green.

6th application, June 29th.—Fine and warm. Used Bordeaux and Paris green. Foliage and fruit are looking fine. No scab or codling moth.

I inspected this orchard on September 25th. The land is a sandy loam, well cultivated. The orchard is fairly well pruned and bears regularly. It has never been sprayed before. The fruit is remarkably free from fungus, except the unsprayed Snows, which had forty-five per cent. of crop scabbed, while sprayed Snows had much larger, finer fruit, and only eight per cent. scabbed.

Agincourt, York Co.—Mr. Patterson's Orchard.

1st application, April 28th.—Clear and warm. On most varieties buds are just showing signs of opening; a few are more advanced. Used Bordeaux and Paris green.

2nd application, May 9th.—Fine and warm. Used Bordeaux and Paris green. Orchard is showing a moderate bloom. Caterpillars quite numerous. Some bark lice.

3rd application, May 22nd.—Warm with a strong wind. Used Bordeaux and Paris green. From 30 per cent to 75 per cent of blossoms have set on various varieties. Spy and Red Astrachan not bearing this year. Caterpillar and canker worm have been at work.

4th application, June 4th.—Fine and warm. Used Bordeaux and Paris green.

5th application, June 16th.—Fine and warm. Used Bordeaux and Paris green. Bark louse and flat-headed borer have been doing considerable damage. Some scab, mostly on Snows.

6th application, June 30th.—Fine and cool. Used Bordeaux and Paris green.

Inspected this orchard September 29th and found it in a good state of cultivation and well pruned. It was sprayed and manured last year and bears regularly. No signs of scab and very few worms. Nearly all the Snow apples are affected with Glœosporium or bitter rot.

Uxbridge, Ontario Co.—Mr. T. A. Britton's Orchard.

1st application, April 29th.—Clear and windy. The earlier varieties are just opening. Used Bordeaux and Paris green.

2nd application, May 11th.—Fine and warm. Buds are just opening and are very profuse. Used Bordeaux mixture. Trees are badly infested with bark louse and caterpillar.

3rd application, May 23rd.—Fine and cool. Used Bordeaux and Paris green. From 50 per cent. to 75 per cent. of blossoms have set. Canker worms have been working on some trees.

4th application, June 5th.—Fine and warm. Used Bordeaux and Paris green.

5th application, June 17th.—Fine and warm. Used Bordeaux and Paris green Flat-headed borer has done considerable damage in this orchard. There is some appearance of scab.

6th application, July 2nd.—Fine and warm. Used Bordeaux and Paris green. Foliage and fruit looking good. Very little sign of scab or Codling moth.

I inspected this orchard September 29th. The ground is a sandy loam. The orchard is kept in sod and bears well. It is in need of pruning. Has not been sprayed before. I found no scab on either the sprayed or unsprayed trees, but some unsprayed trees had considerable wormy fruit.

LINDSAY, VICTORIA CO.—MR. JOHN MCDONALD'S ORCHARD.

1st application, April 30th.—Fine, but high wind. Buds just opening. Used Bordeaux mixture.

2nd application, May 12th.—Cloudy and cool. Used Bordeaux mixture. The blossom on this orchard is profuse. They are fully open on most varieties. Trees are badly infested with tent caterpillar and bark louse.

3rd application, May 26th.—Cool and high wind. Used Bordeaux and Paris green. From 40 per cent. to 50 per cent. of blossoms have set.

4th application, June 6th.—Very warm. Rain a few hours after spraying. Used Bordeaux and Paris green.

5th application, June 18th.—Fine and warm. Used Bordeaux and Paris green. Both flat headed borer and round-headed borer are doing considerable damage. Some appearance of scab.

6th application, July 3rd.—Very warm. Rained about four hours after spraying. Foliage and fruit looking first-class.

I inspected Mr. McDonald's orchard September 30th. The ground is a clay loam and is not cultivated. The fruit and foliage on both sprayed and unsprayed trees are in good condition. There is very little wormed fruit and no scab except a little on unsprayed Snows.

MILLBROOK, DURHAM CO.—MR GEO. H. SOOTHERAN'S ORCHARD.

1st application, May 1st.—Warm, with light rain. Leaf buds just opening. Used Bordeaux and Paris green.

2nd application, May 13th.—Fine and warm. Used Bordeaux mixture. The blossom is profuse and fully open.

3rd application, May 27th.—Cloudy and rain before spraying, but cleared after work started. Used Bordeaux and Paris green. Spy and Greening not bearing this year. On others about 50 per cent. of blossom has set.

4th application, June 8th.—Cloudy with rain in afternoon. Used Bordeaux and Paris green. Foliage looks well.

5th application, June 19th.—Fine with high wind. Used Bordeaux and Paris green. Some scab showing.

6th application, July 4th.—Rained so heavily that work could not be done.

I inspected this orchard October 1st. The soil is a clay loam and not cultivated. The trees are too close and in need of pruning. It bears regularly. Fruit and foliage are in good condition on both sprayed and unsprayed trees, but sprayed trees are 25 per cent. more free from worms than unsprayed. This is the first clean crop for some years. Some years 30 per cent. of crop are unfit to pick on account of scab and worms

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PETERBORO', PETERBORO' CO.—MR. E. B. EDWARD'S ORCHARD.

1st application, May 2nd.—Fine and warm. Leaf buds just opening. Used Bordeaux mixture.

2nd application, May 14th.—Fine and warm. Used Bordeaux mixture. The trees are profusely covered with bloom which is fully open. Trees badly infested with tent caterpillar and bark louse. There are also some bud moth.

3rd application, May 28th.—Heavy rain so that work could not be done. Arranged with Mr. Edwards to do work when it cleared.

4th application, June 9th.—Work had to be postponed on account of rain.

5th application, June 20th.—Fine and warm. Used Bordeaux and Paris green. Snow, Spy and Red Astrachan not bearing. On other varieties from 50 per cent. to 100 per cent. of fruit has set.

6th application, July 6th.—Cloudy with light rain. Used Bordeaux and Paris green. Fruit is looking well but some of the trees are badly affected with twig blight.

I inspected this orchard October 1st and found it in good condition and cultivated. This is the third year it has been sprayed. The sprayed fruit was quite free from worms, which were numerous in the unsprayed. The unsprayed trees were infested with caterpillars while those which were sprayed were clean.

Tweed, Hastings Co —Mr. Robert Gordon's Orchard.

1st application, May 4th.—Weather showery. Leaf buds well advanced. Used Bordeaux and Paris green

2nd application, May 15th.—Fine and windy. Used Bordeaux and Paris green. Orchard showing a moderate bloom. Bark louse and tent caterpillar numerous.

3rd application, May 29th.—Rain one hour after work was done. From 50 per cent. to 75 per cent. of fruit has set.

4th application, June 10th—Fine and high wind. Used Bordeaux and Paris green.

5th application, June 22nd.—Fine and warm. Used Bordeaux and Paris green.

6th application, July 7th.—Cloudy and cool. Use Bordeaux and Paris green. Foliage and fruit look good, very little scab.

I inspected this orchard Oct. 2nd and found it well cultivated and free from fungus on leaves or fruit. The orchard has never been sprayed before this year. On Ben Davis' trees standing side by side, one sprayed and the other unsprayed, the result was very noticeable. The sprayed fruit was free from worms while 30 per cent. of the unsprayed was wormy.

Perth, Lanark Co.—Mr. Cyrus Davis' Orchard.

1st application, May 5th.—Fine and warm. Buds well advanced. Leaf just opening. Used Bordeaux mixture.

2nd application, May 16th.—Fine and warm. Used Bordeaux and Paris green. This orchard is showing a moderate bloom. Found a few tent catarpillar and bark louse.

3rd application, May 30th.—Cloudy and cool. Used Bordeaux and Paris green. From 50 per cent. to 60 per cent. of blossoms have set. Saw some canker worms.

4th application, June 11th.—

5th application, June 24th—Fine and warm. Used Bordeaux and Paris green. Foliage looks well.

6th application, July 8th—Fine and warm. Used Bordeaux and Paris green.

On inspecting Mr. Davis' orchard I found it to be well cultivated. It was sprayed last year. Sprayed trees were in perfect condition both as to fruit and foliage, being 90 per cent better than unsprayed.

Smith's Falls, Lanark Co —Dr. McCallum's Orchard.

1st application, May 6th.—Cool and cloudy. Used Bordeaux and Paris green.

2nd application, May 18th.—Fine and warm. Used Bordeaux mixture. The bloom here is profuse and fully open.

3rd application, June 1st.—Fine and warm. Used Bordeaux and Paris green. Trees are young and healthy.

4th application, June 12th.—Fine but windy. Used Bordeaux and Paris green. Bark louse on two or three old trees young ones not affected.

5th application, June 25th.—Cloudy. Used Bordeaux and Paris green.

6th application, July 9th.—Cloudy with rain an hour after application. Used Bordeaux and Paris green. Some twig blight.

Inspected Dr. McCallum's orchard Oct. 6th. It is well cultivated. Neither worms nor fungus have attacked the orchard this year. Have been troubled with both previous years, but never very seriously. A hailstorm on July 28th injured the fruit and trees badly. The orchard was never sprayed before.

Winchester, Dundas Co.—Mr. Jas. P. Fox's Orchard

1st application. May 7th.—Fine and warm. Buds well advanced. Leaf just opened. Used Bordeaux mixture.

2nd application, May 19th.—Fine and warm. Used Bordeaux and Paris green. The bloom on some varieties is heavy on others only moderate. It is almost all fallen. Bark louse are very bad and some tent caterpillars.

3rd application, June 2nd.—Fine and windy. Used Bordeaux and Paris green.

4th application, June 13th.—Fine and high wind. Used Bordeaux and Paris green.

5th application, June 26th.—Fine and warm. Used Bordeaux and Paris green. Foliage and fruit looking well.

6th application, July 10th.—Fine and warm. Used Bordeaux mixture. Some twig blight.

I inspected this orchard on Oct. 5th. It stands in sod, and bears regularly Has not been sprayed before. Fruit and foliage in perfect condition as far as fungus is concerned and very few worms.

General Observations.

The preparation and application of insecticides and fungicides is not an exact science, and no one should hesitate to undertake the spraying of his orchard. For although to obtain the best results experience is necessary, yet much good can be done even should the work not be done exactly as recommended.

The most important point is to make the application just at the time it will be most effectual in accomplishing the object for which it is applied.

The fruit crop is the second most valuable crop grown in Ontario, and the industry is still in its infancy. Therefore it is necessary that all possible assistance and information should be given to the fruit growers in order to assure success.

I have been strongly impressed with the importance of spraying during the fourteen years I have done it on my own fruit farm, and more than ever after the knowledge gained while conducting the experimental work this year.

I think it highly important that the work be continued, and that a bulletin be published treating in as plain a manner as possible of a few of the most important insect enemies. It should be illustrated with cuts of these insects at their different stages of development so that they could easily be recognized and should contain information as to the seasons at which the various stages are attained and the best manner of destroying them at each stage, so that the orchardist would be on the watch and know at once what remedy to apply.

The consensus of opinion expressed by fruit growers and business men throughout the Province, has been that for the expenditure incurred the Minister of Agriculture has conferred as great a boon upon the fruit growers of the Province as he has in any other direction, in developing, as he has, a policy which aims to benefit the agricultural classes.

TWENTY-SEVENTH ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO

1896.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE.)

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO.

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1897.

CONTENTS.

Rev. Thomas W. Fyles, F. L. S.

Member of the Council of the Entomological Society of Ontario, from 1882 to 1888; delegate to the Royal Society of Canada, in 1890, 1894 and 1895; member of the Editing Committee of the "Canadian Entomologist," since 1889.

J. M. Denton.

TWENTY-SEVENTH ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO,

1896.

To the Honorable John Dryden, Minister of Agriculture:

SIR,—I have the honor to transmit to you the Twenty-Seventh Annual Report of the Entomological Society of Ontario. It contains a full account of the proceedings at our thirty-fourth annual meeting, which was held in the city of London, on the 21st and 22nd of October last, for the election of officers and the transaction of the general business of the Society. The report includes the addresses delivered and papers read at the meeting, together with the financial statement of the Treasurer and the reports of the various sections and departments of the Society. Considerable attention is given to the outbreak of the "Army Worm" in this Province, last summer, and the destructive work of the "Tussock Moth" to the shade trees in Toronto, and other papers are submitted dealing with matters of economic and scientific interest in connection with the study of Entomology.

The Canadian Entomologist, the monthly magazine issued by the Society, has now completed its twenty-eighth volume, which will be found to contain a large number of papers of a highly scientific character contributed by the most distinguished students of this branch of science in Canada and elsewhere.

I have the honor to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,
Editor.

OFFICERS FOR 1897.

President ..... J. W. DEARNESS ..... London.

Vice-President ..... H. H. LYMAN ..... Montreal.

Secretary ..... W. E. SAUNDERS ..... London.

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" 2 ..... REV. C. J. S. BETHUNE, D.C.L .... Port Hope.
" 3 ..... ARTHUR GIBSON ..... Toronto.
" 4 ..... A. H. KILMAN ..... Ridgeway.
" 5 ..... C. G. ANDERSON ..... London.
Ontario Agricultural College .... PROF. J. H. PANTON ..... Guelph.

Librarian and Curator ..... J. A. MOFFAT ..... London.

Auditors ..... J. H. BOWMAN ..... do
R. W. RENNIE ..... do

Editor of the "Canadian Entomologist". REV. C. J. S. BETHUNE, F.R.S.C... Port Hope.

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ANDERSON, RENNIE, BOWMAN,
ELLIOTT AND SPENCER ..... London.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

1896.

The thirty-fourth annual meeting of the Entomological Society of Ontario was held in its rooms, in Victoria Hall, London, on Wednesday and Thursday, October 21st and 22nd, 1896, the President, Mr. J. W. Dearness, of London, occupying the chair.

The meeting was called to order at 3 o'clock p.m , on Wednesday, when the following members were present: Rev. T. W. Fyles, South Quebec; Mr. H. H. Lyman, Montreal; Mr. J. D. Evans, Trenton; Rev. C. J. S. Bethune, Port Hope; Prof. J. H. Panton, Ontario Agricultural College, Guelph: Messrs W. E. Saunders (Secretary), J. A. Balkwill (Treasurer), J. Alston Moffat (Curator), J. H. Bowman, H. P. Bock, B. Green, W. Scarrow, T. Green, W. J. Stevenson, J. S. Pearce, J. B. Spencer, J. Law, W. Lochhead, W. Percival, and Drs. Woolverton and Hotson, London, and Robert Elliott, Plover Mills. Letters of apology were read from Dr. James Fletcher and W. H. Harrington, Ottawa, regretting their inability to attend the meeting.

At the request of the President the report of the Council for the past year was read by Dr. Bethune.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario beg to present the following report of their proceedings during the past year:

They have much pleasure in stating that the membership of the Society has been well maintained, and that there has been a gratifying increase in the members from Ontario and an especially large addition in the Montreal branch, from the Province of Quebec.

The twenty-sixth annual report on Economic and General Entomology was presented to the Minister of Agriculture for Ontario, in December last and was printed and distributed at the opening of the session of the Legislature. It contained one hundred and two pages, and was illustrated with thirty-four wood cuts and two full page portraits, one of the late Professor C. V. Riley, the most able and distinguished Entomologist in North America, who had been killed by a fall from his bicycle a few months previously, and the other of Mr. William H. Edwards, author of the "Butterflies of North America," the most valuable and important work of the kind ever published,—both of these gentlemen were honorary members of our Society. In addition to an account of the proceedings at the annual meeting, which included an interesting address on "The New Agriculture," by Mr. C. C. James, Deputy Minister of Agriculture, the volume contains the following valuable papers: "The value of Entomology," by Dr. James Fletcher; "How the Forest in Bedford was swept away," by Rev. T. W. Fyles; "Insect injuries of the year 1895," by Dr. Fletcher; "The growth of the wings of a Luna Moth," "Observations on the Season of 1895," and "Variation, with special reference to Insects," by J. A. Moffat; "Some winter insects from Swamp Moss," by W. H. Harrington; "Birds as protectors of Orchards," by Mr. E. H. Forbush; "The Rocky Mountain Locust and its allies in Canada," by Mr. S. H. Scudder. An abstract was also given of the proceedings of the seventh annual meeting of the Association of Economic Entomologists, together with some of the papers that were of special interest and value to the general reader.

The Canadian Entomologist, the monthly magazine published by the Society, completed its twenty-seventh volume in December last. The numbers of the twenty-eighth volume have been regularly issued at the beginning of each month during the current year; ten numbers, containing 270 pages, have thus far been published, containing a large number of papers of high scientific merit. The series of illustrated articles on the Coleoptera of Canada, by Mr. H. F. Wickham, has been continued and proves of great value to those studying this order of insects.

A fairly complete collection of the important insects of the country is now in the Society's cases. Some new and interesting species have been added during the year.

The most important addition to the library during the year is a complete set of the Annals of the Entomological Society of France. Nineteen other new volumes have been added and catalogued, besides the usual large number of scientific periodicals and exchanges.

The Council desires to express its satisfaction with the careful manner in which the Curator, Mr. J. Alston Moffat, continues to look after the collection of specimens, scientific instruments and library of the Society. Visitors have found him in constant attendance even outside of the hours at which he is expected to be present. Any one, whether allied with the Society or not, seriously studying any phase of insect life, has been cheerfully assisted by him. Farmers, horticulturists, and students bringing their specimens to the rooms in open hours, have thus the opportunity to have such compared with authentic specimens and identified.

The present accommodation which has served the Society since 1881 has become inadequate. Arrangements are being made to obtain new and more commodious quarters in the fine new structure in course of erection by the Young Men's Christian Association of this city.

The reports of the Secretaries of the several scientific Sections printed elsewhere show that, with the exception of the Ornithological one, they have held regular meetings at which useful and interesting lists of subjects were discussed.

The report of the Treasurer is highly satisfactory. The balance on hand, about $530, at the close of the financial year, August 31st, 1896, is larger than usual owing to the fact that some accounts had not then been presented for payment, but the current expenses for the remainder of the year will fully absorb this amount.

The Council desire to place upon record their grateful appreciation of the liberal grant from the Legislature of Ontario, which has enabled the Society to carry on during many years past its scientific and practical work in a manner which would otherwise have been impossible.

The Society was represented by Mr. J. D. Evans, of Trenton, at the annual meeting of the Royal Society of Canada, held in Ottawa, in May last. His report is also presented herewith.

It is with profound regret that the Council record the loss during the past year of two of their colleagues. Mr. John M. Denton, of London, one of the earliest members of the Society, died after an illness of some months on the 24th of March last. He was one of those who originally formed the London branch of the Society, and took a most active interest in it and the parent Society till the close of his life. For five and twenty years he was a member of our Council and did much to maintain the prosperity and usefulness of the Society. His sterling honesty, unfailing courtesy and genial hospitality won for him the respect and affection of all our members. We all deplore his loss as one personal to ourselves, and deeply sympathise wtih his widow in her bereavement.

On the 3rd of April Captain J. Gamble Geddes, of Toronto, died after a few days' illness, brought on by a severe cold. During several years he took an active part in the London branch and held the offices of Secretary-Treasurer, Vice-President and President in succession. After his removal from London he continued to take a great interest in the Society, contributing valuable papers to its publications and holding the position of

Director on the Council for many years. He was a diligent and enthusiastic collector in the order Lepidoptera and gathered together large stores of specimens, most of which are now in the museum of the Geological Survey at Ottawa. His untimely death is a source of deep grief to his colleagues and to a large circle of relatives and friends throughout the Dominion.

The Council desire further to tender their respectful sympathy to Miss Eleanor A. Ormerod, of Torrington House, St. Alban's, England, in her bereavement owing to the death of her sister and life-long colleague and companion, Miss Georgiana Elizabeth Ormerod, who died on the 19th of August last, after an illness of several months duration. The deceased lady was remarkable for her many talents and acquirements as a botanist, a conchologist, an artist, and a linguist, and for her great benevolence and generosity. She assisted her sister very greatly by illustrating her publications, helping in her correspondence and by her unfailing encouragement and wise counsels. She is widely known especially by the series of large coloured diagrams of injurious insects that she published under the auspices of the Royal Agricultural Society of England, and which are found to be of great practical use in illustrating lectures and addresses in this country as well as in Great Britain.

All of which is respectfully submitted.

J. W. Dearness,
President.

Mr. W. E. Saunders presented and read the report of the Secretary.

REPORT OF THE SECRETARY OF THE ENTOMOLOGICAL SOCIETY

FOR THE YEAR 1895-6.

The year 1895-6 has been one of unusual activity to the local members of the council into whose hands the conduct of affairs at the Society's headquarters is placed, but the labors of the Secretary have been reduced to a minimum by the kind and efficient work done by the Librarian and Curator, who has attended to almost all of the work which might otherwise have fallen upon the Secretary. During the early part of the year the council issued a leaflet setting forth the advantage and usefulness of membership in the Society; the said leaflet being for the purpose of enclosure in the correspondence of the members and it is hoped that the influence of the Society will be widened thereby.

Seven council meetings have been called during the year, and three consultation meetings, to which all the local members were invited; for the conduct of business in general, and more especially for that relating to the change of rooms.

The negotiations which had begun at the time of the last annual meeting with the Young Men's Christian Association of this city, for the lease of a room in their new building, have continued throughout the year and have about reached a favorable conclusion, so that unless a hitch occurs, the Society should be occupying the proposed new room in three or four weeks.

The routine work of the Society has proceeded as usual, the meetings of the sections having been regular, except the Ornithological section which did not meet during the year. Particulars of the work of the other sections will be given in the reports by their Secretaries.

Some correspondence has taken place with those in charge of the meeting in Canada of the British Association in which the Secretary has been authorized to pledge the goodwill and hospitality of the Society to the visiting members, but the matter of representation at the meeting has been left for the general council to settle at the annual meeting.

All of which is respectfully submitted,

W. E. Saunders,
Secretary.

The Treasurer, Mr. J. A. Balkwill, read the following report of receipts and expenditure for the year ending August 31st, 1896 :

REPORT OF THE TREASURER.

RECEIPTS, 1895-6.

Balance on hand Sept. 1st, 1895	$ 341 91
Members' fees	324 54
Sales of Entomologist	82 59
" pins, cork, etc	127 18
Government grant	1,000 00
Advertisements	18 72
Interest	13 40
	$1,908 34

EXPENDITURE, 1895-6.

Printing	$ 571 43
Report and meeting expenses	159 42
Library	37 60
Expense account, postage, etc	78 90
Rent and fuel	103 05
Insurance	28 00
Salaries	300 00
Pins, cork, etc	99 01
Balance on hand, August 31st, 1896	530 93
	$1,908 34

We the Auditors of the Entomological Society of Ontario hereby certify that we have examined the books and vouchers of the Treasurer, and find them well kept and correct, and that the above is a true statement of the accounts of the Society.

JAS. H. BOWMAN,
W. T. MCCLEMENT, } Auditors.

Mr. Balkwill explained the several items of expenditure and stated that the balance on hand would all be absorbed in printing and other expenses before next year's subscriptions came in. The President in accepting the report, commented on the loss the Society had sustained through the removal of Mr. McClement, who has been appointed Lecturer in Chemistry in the Armour Institute at Chicago.

Mr. J. A. Moffat presented and read his report as follows :

REPORT OF THE LIBRARIAN AND CURATOR

FOR THE YEAR ENDING 31ST OF AUGUST, 1896.

The number of volumes added to the Library during the year was nineteen of which nine were exchanges bound for the Society ; the others being received from various sources, already bound.

The most important of these were

The Missouri Botanical Garden.

The Year Book of the U. S. Department of Agriculture.

The Report of the N. Y. State Entomologist : Dr. Lintner.

The Report of the Gypsy Moth Commission.

The Proceedings of the Royal Society of Canada.

The Fifteenth Annual Report of the U. S. Geological Survey.

Acknowledgement is due to John Hamilton, M.D., Allegheny, Pa., for two volumes of his Coleoptera papers.

The whole number of volumes on the Library register is now 1,418.

A full set of the annals of the " Entomological Society of France," was obtained, in exchange for a full set of the publications of the Entomological Society of Ontario.

The number of volumes issued to local members was seventy-three.

But slight addition was made to the Society's native collection during the year ; most of the new material obtained being yet undetermined.

Respectfully submitted,

J. ALSTON MOFFAT,
Librarian and Curator.

Dr. Bethune moved, seconded by the Rev. T. W. Fyles, that the Annals of the Entomological Society of France, and such other volumes as may be decided upon by a committee to be appointed by the President, be bound.—*Carried.*

By instruction of the local members of the council, the Secretary brought up the question of cataloguing the books in the Society's Library by the London Free Library Board as an addendum to their reference list. After some consideration of the subject, it was moved by Mr. W. E. Saunders, seconded by Mr. J. D. Evans, that this Society views with favor the proposition of the Free Library Board to publish a list of the books belonging to the Society in their catalogue.—*Carried*

The Secretary called the attention of the meeting to the importance of having the Society represented at the meeting of the British Association, which is to be held in Toronto next year, It was thereupon moved by the Rev. T. W. Fyles, seconded by Mr. Evans, that the President and Editor be, and are hereby, appointed to represent the Entomological Society of Ontario at the meeting of the British Association for the Advancement of Science, to be held in Toronto in 1897, and that the President be authorized to appoint additional representatives at his discretion.—*Carried.*

Mr. J. D. Evans then read his report as delegate to the Royal Society at its meeting in Ottawa in May, 1896, as follows:

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

As the representative of the Entomological Society of Ontario, I have the honor to submit a brief report of its proceedings and work during the past year.

It gives me much pleasure to be able to report that the membership continues to increase and is now much larger than ever heretofore, and that interest in its work is still unabated.

Valuable additions have been made to the Library and Collection of Insects—the number of volumes thus added being thirty-eight, making the total 1,399 volumes.

The Canadian Entomologist, the official organ of the Society, although not numbering quite so many pages as in the year previous, is yet largely increased beyond former years.

During the year 1895 it completed its twenty-seventh volume of three hundred and fifty-eight pages. There were forty six contributors, of whom twenty-nine were from the United States, three from England, and one from Germany—and of the remaining thirteen (Canadian) it is pleasing to be able to state that five of them were from the newer provinces west of Lake Superior. These contributed in the aggregate 100 articles in which were described 109 new species and seven new genera.

Among the more important papers published during the year may be mentioned the following:

The Coleoptera of Canada—Mr. H. F. Wickham, which ran through eight numbers.

Canadian Coccidæ—Mr. T. D. A. Cockerell.

Preliminary Studies in Siphonaptera—Mr. Carl F. Baker, which appeared in seven numbers.

Variation in Nemeophila Petrosa at Laggan in Western Alberta—Mr. Thos. E. Bean.

Synopsis of the Dipterous Genus Phora—Mr. D. W. Coquillett.

Mounting Insects without pressure—Mr. R. W. Rennie.

The Coleoptera collected at Massett, Queen Charlotte Island, B.C.—Rev. J. H. Keen.

Descriptions of the Larvæ of certain Tenthredinidæ—Mr. Harrison G. Dyar.

Notes upon the North American Saturnina, with List of the Species—A. Radcliffe Grote, A.M.

Butterflies of Southern Manitoba—Mr. E. F. Heath.

The Larvæ of the North American Saw-flies—Mr. Harrison G. Dyar.

The Life-history of Pamphilia Manitoba, Scud—Rev. Thos. W. Fyles.

To the aforementioned articles should be added also the numerous book notices of current publications of entomological literature, correspondence, obituary notices, etc,

In addition to the Monthly Magazine the Society publishes an Annual Report to the Department of Agriculture of the Province of Ontario, the twenty-sixth of which was issued in 1895, which consisted of 102 pages with numerous illustrations; in this is given a very full report of the thirty-third annual meeting of the Society, which was held in their rooms in London, on Wednesday and Thursday, the 27th and 28th of November, 1895. An important feature of the annual meeting was an open meeting on the evening of Wednesday, in the City Hall, at which His Worship the Mayor presided and Prof. C. C. James, Deputy Minister of Agriculture of Ontario, delivered a very exhaustive and interesting address on "The New Agriculture," which was followed by Mr. James Fletcher with a very instructive address on "The Value of Entomology."

The annual report also contains the following papers:

How the forest in the District of Bedford was swept away—Rev. Thos. W. Fyles.

Insect Injuries of the year 1895—Mr. James Fletcher.

The growth of the wings of the Luna Moth—Mr. J. A. Moffat.

Observations on the season of 1895—by the same author.

Variation with special reference to Insects—also by the same author.

Some winter insects from swamp moss—Mr. W. Hague Harrington.

Birds as protectors of orchards—Prof. E. H. Forbush, Ornithologist of the Massachusetts Board of Agriculture.

The Rocky Mountain Locust and its allies in Canada—Mr. Samuel H. Scudder.

The reports of the Botanical, Geological and Microscopical Sections of the Society.

The report of the Montreal Branch.

The report from the Entomological Society of Ontario to the Royal Society of Canada.

And also a very full report of the proceedings of the seventh annual meeting of the Association of Economic Entomologists.

The Botanical Section reported that regular weekly meetings had been held during several months, at which the attendance was much in advance of previous years. Several papers had been read at the different meetings. One public field day was held at which much enthusiasm was manifested.

The Geological Section reported as having had a most prosperous year. The membership had increased, and average attendance at meetings was greater. A number of valuable papers have been contributed, and several very successful trips made to places of geological interest.

The Microscopical Section reported as having a number of very successful meetings at which a number of interesting subjects were presented.

The Montreal Branch presented their twenty-second annual report shewing a number of meetings held at which excellent papers were read, and the membership increased.

J. D. Evans,
Delegate.

REPORT OF THE MONTREAL BRANCH.

Mr. H. H. Lyman read the following report:

The twenty-third annual meeting of the Montreal Branch was held in the library of the Natural History Society, on Tuesday evening, 19th May, at 8.15 o'clock.

Members present: Messrs. H. H. Lyman, President; A. F. Winn, Vice-President; G. Kearley, G. C. Dunlop, Dr. Wyatt Johnston, E A. Norris, J. B. Williams, E. T. Chambers, T. D. Brainerd, H. Brainerd, G. H. Moore, and Lachlan Gibb, Secy.-Treas.

The President presented the following report of the Council:

Report of Council.

In presenting their twenty-third annual report the Council have much pleasure in referring to the increased prosperity of the Branch, especially in regard to the large number of new members who have joined during the year.

Since our last annual meeting eleven new members have been added to our roll, but we have to deplore the loss by death of Mr. E.-M. Gibb, who had only joined the Society during the previous year.

During the year eight meetings have been held, and the following papers and communications were read:—

The Life history of Pamphila Manitoba—Rev. T. W. Fyles.

Note on the occurrence of Ælliopos Titan—A. F. Wynn.

Notes on the season of 1895—H. H. Lyman.

Notes on the life history of Colias Interior—H. H. Lyman.

Description of the egg and young larva of Cerura Borealis—H. H. Lyman.

Notes on Trychosis Tunicula-rubra—Rev. T. W. Fyles.

Notes on the preparatory states of Erebia Epipsodea—H. H. Lyman.

The Importance of Entomological Studies to our Agricultural and Fruit Growing communities—Rev. T. W. Fyles.

Prairie and Mountain Plants—James Fletcher.

The larger Species of Argynnis and the Mystery of their Life History—H. H. Lyman.

During the season a course of short lectures to young people was inaugurated by the Natural History Society with the active assistance of our Branch. The lectures were delivered in the Society's lecture hall on Saturday afternoons, and it is hoped that they will have some beneficial effect in interesting some of the young people in natural history studies.

The Branch is under great obligations to the Natural History Society for the recognition extended to it as an affiliated society or section, such recognition carrying with it the valuable privilege of the free use of their rooms for our meetings when desired, while we retain unimpaired our connection with the parent Society in London.

The Council would recommend that all books belonging to the Branch should be inscribed with our name and placed in the Natural History Society's library on the understanding that we remain the owners of them, and that our members have free access to them.

The Treasurer's report shews that the finances of the Branch are in a healthy condition, and the Council would recommend to the new Council the advisability of considering how the surplus may be expended for the interest of the Branch.

Respectfully submitted on behalf of the Council.

H. H. Lyman,
President.

The Treasurer submitted his report, and it was moved by G. C. Dunlop, seconded by G Kearley, That the reports of the Council and the Secretary-Treasurer be received and adopted. Carried.

The following officers were elected for the ensuing year :

President—H. H. Lyman.

Vice-President—A. F. Winn.

Secretary-Treasurer—Lachlan Gibb.

Council—G. C. Dunlop, G. Kearley.

The President then delivered his annual address in which he dwelt upon the necessity of more of the members taking an active part in preparing papers and sustaining the interest of the meetings. He also drew attention to some of the problems in connection with the Lepidoptera which awaited solution, some of which the members ought to be able to get some light on during the season.

Mr. G. Kearley, in moving a vote of thanks, suggested that the list of problems should be printed and a copy sent to each member.

The meeting then adjourned.

LACHLAN GIBB,
Secretary.

ANNUAL ADDRESS OF THE PRESIDENT OF THE MONTREAL BRANCH.

GENTLEMEN,—In most societies it is usual for the President to deliver an annual address at the annual meeting and this custom can, I think, be adopted in our Branch without disadvantage.

From the reports of the Council and of the Secretary-Treasurer it can be seen that the Branch has had a reasonably successful season, in regard both to the number of papers read and to the large number of new members who have joined us.

There is one point, however, to which I would earnestly invite your attention and that is that the labour of providing papers for the meetings is left too much to the President and I feel that I do not receive the assistance in keeping up the interest of the meetings that any President has the right to expect from the members.

With the single exception of Mr. Winn's "Note on *Aellopos Titan*" read at the October meeting, all the papers were contributed by me or secured by me from outside friends like Mr. Fyles and Mr. Fletcher.

It seems to me that every member might do something to contribute to the interest of the meetings.

The simplest paper upon anyone's experience would at least do something to relieve the annual report of the monotonous repetition of my name as the contributor of papers.

Subjects of discussion might be suggested and genera or groups taken up and systematically studied, the members bringing together all their material in these genera and verifying determinations, studying up the generic characters and so learning why a particular species is placed in a particular genus.

I doubt if any of our members can tell in what a *Neonympha* differs from a *Satyrus* or an *Erebia*, or a *Phyciodes* from a *Melitœa*. Then more interest might be shown in bringing specimens to the meetings. Specimens do not need to be rare in order to be worth showing. Well-set specimens in fine condition of even the commonest species are always a pleasure to look at, and it would at least show that the members were actually collecting specimens.

Further, I hold that every true entomologist should be something more than a mere collector of specimens. We should all seek to do some original work, no matter how little, in the field that we study.

A great temple of knowledge of scientific truth is being built up by the workers in all departments of science, in all lands, and through all the centuries and we should all strive to bring at least one stone, well cut and true, to build into this great temple.

There are many interesting questions awaiting solution and some of us ought to be able to do something towards elucidating some of them. To mention a few among the butterflies, *Danais Archippus:* How early does this species appear here? Is it ever seen before the end of June? Is there a second brood? Scudder thinks not in the north.

Argynnis Cybele. For this species my paper read at the last meeting is a sufficient indication of points that require elucidating and I should be very grateful for any assistance, particularly for the donation of living females as early as obtainable.

Argynnis Myrina. Why is the emergence of this species spread over so long a time as described by Scudder? Are there three broods here?

Melitæa Phaeton. This species is attacked by a Pteromalid parasite which has not been determined and its life history is unknown, though there is some reason to believe that it passes two years before completing its cycle, is this the case? I greatly doubt it.

Of *Grapta Comma*, Scudder writes that "careful statements of its comparative abundance are needed from all parts of Canada, before its geographical distribution can be fully understood." It is attacked by an unknown Dipterous parasite which should be determined.

Grapta Progne. Does this species feed on elm as stated by Harris? How late in the spring do the hibernators fly? When does the summer brood appear, become abundant, and disappear?

Eugonia J-Album. So little is known of this species that notes of every kind are desirable. Is there more than one brood? Why are there more individuals late in August and September than earlier? How long does it continue on the wing?

Vanessa Antiopa. When does the first brood of the season appear here? When the second? Does it ever hibernate as a chrysalis?

Limenitis Disippus. How many broods are there in this locality?

Satyrus Nephele. Is it subject to attack by any parasite?

Neonympha Canthus. Has it any parasites?

Neonympha Eurytris. Is there a second brood or part of a brood here? If so how does it compare in numbers with the first? Are there any parasites?

Pieris Oleracea. How many broods are there? Why has it so generally disappeared before *Pieris Rapæ?*

This last question is one which might puzzle any scientific man even of the first rank. Still there must be some reason for it and any of us might stumble on it.

Is it possible that *Oleracea* was comparatively free from parasitic attacks before the advent of *Rapæ* which is preyed upon by many species and that some of the latter's enemies have turned their attention to the former?

Our meetings are now closing and field work should begin. Will not the members strive to have something of interest to tell or show when we again begin our meetings in the autumn.

The branches other than Lepidoptera and Coleoptera, are sadly neglected. Can we not do something to work up our local forms of the Neuroptera, Orthoptera, Hymenoptera, Diptera, and Hemiptera?

H. H. Lyman.

The following paper was then read :

NOTES ON THE SEASON OF 1896.

By the Rev. Thomas W. Fyles, F. L. S., South Quebec.

For half of the year Quebec seems to be the very throne of the ice king. The winters are long, and, in them, the storms are frequent, and the frosts severe. This spring people were crossing the St. Lawrence on the ice till St. George's day (April 23rd). When the "bridge" broke up a school-girl and one or two other persons were taken from the floating masses in canoes. Frost and snow come upon us in the end of October. The season then for out door Entomological work is a brief one—little can be done before the first of May, and but little after the end of September.

The fancy of the English Entomologist in Canada, must often revert with regret to his experiences in the old country—to his early spring work at the sallows, and his late captures at ivy bloom—to his welcome of *Gonepteryx rhamni* in February, and his farewell to *Pœcilocampa populi* in December.

To those who make a practice of rearing insects there will, even in the winter months, be occurrences of interest. Thus, early in the year on examining some cocoons and chrysalids that I had in the house, I found that a fine specimen of *Trogus fulvipes*, Cresson, had made its exit from a pupa of *Papilio Turnus*, Linn.

From a jar of earth in which a batch of larvæ of *Deilephila chamænerii*, Harr. that had fed on *Epilobium coloratum*, Muhl, had buried themselves, I obtained—not the moths I expected, but—a number of two-winged flies of the species *Musicera anonyma*, Riley. The maggots of this species had destroyed the larvæ of the moth.

Our long winters afford us many opportunities for going over our summer captures, for identifying them and placing them in their proper order. And here I would record the capture at Sherbrooke, on the 25th of May, 1895, by the Rev. Abbe Begin, of that very rare and elegant butterfly *Thecla lœta*, Edw. It was sent to me in February of this year for identification.

The following is a description of it :

Thecla Lœta, *Edwards*, (Male).

Colour above :—Black with a purple blush. Near the hind margin of the secondaries are three ultramarine patches, with a black reniform spot near the outer edge of each.

Colour beneath :—Ash grey approaching to brown with a slight blush of purple on the primaries. Towards the hind margin of these there is an indistinct line, with a touch of light red near the upper part of it.

On the secondaries there is an irregular, but curved, row of light red spots, each with an *outer* edge of white. Near the outer angle there are three other such spots with the *inner* edge of white.

One of our earliest species is *Brephos infans*, Moesch. It is found in the birch woods around Montreal, while the snow is yet on the ground. I have not found the species in this neighbourhood though I have often searched for it.

It is a common saying at Quebec, "We have no spring." Summer seems to burst upon us all at once. This year on the 19th of April the swallows came ; on the 21st flocks of ground-birds appeared ; on the 26th the first hibernated butterfly shewed itself.

The first caterpillars to appear openly are the "Woolly Bears." Full grown specimens of *Phragmatobia rubricosa*, Harr. may be seen in April, shuffling over the snow. In colour they are soft seal brown, slightly darker towards the head. The head is black and shining, and the feet are reddish brown. The specimens I have taken have not seemed inclined to feed, but have soon spun themselves up. Their cocoons have been light, and have had the larval hairs entangled in the meshes.

There is usually a space under the snowbanks, in the spring, caused by the warmth of the earth, and in this space vegetation commences. The creatures therefore may have fed up before they appeared upon the surface.

Among the immature larvæ that shew themselves in the early spring are those of *Euprepia caja*, Linn. On their first appearance at that season they are black, and about three fourths of an inch in length. They crawl out upon the side-walks, and upon the floors of out-buildings.

Some years ago I brought a batch of this species from the egg to perfection. They hibernated—if I remember rightly—after the second moult.

In the spring of 1891 I collected some larvæ of like appearance and habits, thinking I would raise a few more specimens of the moth. These larvæ moulted on the 4th of May, and shewed a broad side-line of red hairs, so I knew that I had been mistaken in supposing them to belong to *E. caja*. They again moulted on May 20th. On emergence from the old skins the heads and legs of the larvæ were honey-yellow, but they soon changed to jet black. On the 17th of June after having drawn, in every instance, a few leaves together for a tent, they went into chrysalis without spinning a cocoon. The chrysalid was blue-black with a bloom like that of an Orleans plum. The larval skin remained attached to the extremity of the chrysalis case. On July 10th the perfect insect appeared. It was *Arctia virgo*, Linn.

Speaking of larvæ, I would tell of the strange winter-quarters of a caterpillar of a noctuid which I found early in the year. The year before I had obtained a specimen of that very rare hymenopterous parasite, *Sphecophagus prædator*, Zabriskie. From its position when I found it, I judged that it must have come either from a nest of *Vespa media*, Oliv., or from a mud castle of *Pelopeus cementarius*, Drury, both of which I was keeping in a window of my study. Hoping to obtain more specimens of Prædator, I collected in the winter all the wasps' nests I could. Snugly coiled up in a cell of one of those brought to me was the larva I am telling of. It became active in the warmth of my room, but I had nothing among my house-plants that it would feed upon, and it soon perished.

May the 1st was a bright, cold day. Frogs were croaking amid the broken ice and masses of snow in the pools, and large banks of snow lay in the woods. The poplars, birches and alders were in catkin, and the leaf-buds of the red elder (*Sambucus pubens*, Michx.), *near the ground*, were opening. On this day I saw on the sunny side of a stem a specimen of *Vanessa Antiopa*, Linn., bright in colour, and without a flaw.

After the 1st of May vegetation progressed by leaps and bounds, and insect appearances multiplied. By the 13th such delicate forms as *Lycæna marginata*, Edw., *Nemoria gratata*, Walker, *Rheumaptera intermediata*, Gn., etc, were on the wing. On this date I saw a pair of *Osmia proxima*, Cresson, *in coitu* resting upon willow catkins. At the same time larvæ of *Pœdisca saligneana*, Clemens, which had remained through the winter enclosed in webs within their galls on Solidago, left their domiciles and buried themselves in the soil. The imagos appeared on the 30th of May.

On the 15th of May a specimen of *Feniseca Tarquinius*, Fab., appeared in my breeding-cage. As the chrysalid had been out of doors all the winter this marks the date of appearance of the early brood of the species.

Lobophora angulineata, Grt., was common on the bolls of spruce trees on the 19th, and on the 21st *Lobophora atroliturata*, Walker, appeared.

On the 20th a full grown larva feeding upon choke cherry (*Padus Virginiana*, L.) was brought to me. The next day it buried itself and went into chrysalis. The following is a description of it: Length an inch and three quarters. Head, rather small, brown. Body plump and smooth. Colour, light drab. Spiracles outlined with dark brown. Just above them is a dark brown narrow side-line. On each segment a transverse dark brown line runs backward to a sub-dorsal line of lighter brown. On each segment along the back and pointing backward is a light-brown V-like mark, with a pale patch on each side of it.

The larva could not have attained its growth in the fortnight in which the choke-cherry had been in foliage—it must have hibernated.

The buried caterpillar made a cyst strengthened by a slight web. The chrysalis was very dark glossy brown, and had a terminal spine. The moth appeared on the 27th of June, and proved to be *Mamestra imbrifera*, Guen.

The beautiful larvæ of *Phyciodes Harrisii*, Scudder, were common on the white aster (*Diplopappus umbellatus*, Tor. and Gr.), on the 21st of May and till the end of the month.

On the 6th of June I went to "The Gomin." In the fact that I knew no place there in which to sit down lay the chief discomfort of my first visits to this swamp. Fortunately in one of my rambles I discovered a huge solitary boulder half imbedded in the spongy soil. Now I am sure of a resting-place whenever I can find leisure to visit the swamp. I can sit or recline at ease on this stone, which surely some benevolent genie, anticipating the needs of weary naturalists, deposited far away from its original matrix.

Seated upon this stone that 6th of June I looked round upon the scene. Before me, some hundreds of yards distant, was the one tall pine, my landmark and guide to exit from the swamp. Around extended the level reaches of sphagnum, forming a vast amphitheatre bounded with tamarac and spruce. The surface of this area was be utified with innumerable blossoms. The prevailing colour was rose, from the lovely blossoms of *Rhodora Canadensis*, L., and *Kalmia angustifolia*, L., but this was relieved by the white tufts of cotton-grass, *Eriophorum polystachyon*, L., and the clustered blossoms of the *Ledum latifolium*, Ait. The pitcher-plant, *Sarracenia purpurea*, L., lifted here and there its tall stalks, each surmounted by a yet unopened bud and resembling the maul-stick of the painter, and here and there the handsome blossoms of *Cypripedium acaule*, Ait., appeared.

In this solitude, seated upon my chair of state, I could almost fancy myself the monarch of all I surveyed, but thoughts of the kind were dispelled when I saw a *habitant* approaching. I noticed a peculiarity in this man's gait—he lifted his knees like a high-stepping horse, as he made his way through the yielding sphagnum. The motion struck me as grotesque; but soon afterwards, on moving away, I found myself making progress through the swamp in the same absurd fashion. I suppose it to be the mode of progression natural to the case.

As the man passed there now and then arose, disturbed by his approach, a specimen of that handsome chestnut-coloured moth *Epirranthus obfirmaria*, Hbn., or one of *Ematurga faxonia*, Minot, or one of *Chionobas Jutta*, Hübner.

Speaking of Jutta, I lately found among my papers a description of that butterfly written by a former member of this society, whose memory is dear to many of us—Mr. G. J. Bowles. I give it as a memento of our departed friend:

"*Chionobas Jutta*, Hübner. Lighter brown than Nephele, 3 eyelets in each fore-wing, centre one smallest, 4 or 5 on each hind-wing, the one at anal angle largest. All the eyelets are small in size. Beneath, markings of fore-wings are repeated. Hind-wings marbled with brown and light grey, one eyelet near anal angle."

On June 10th, I took a pair of *Dolerus Aprilis*, Morton, among young spruce trees on Levis Heights.

On June 11th, a specimen of *Cerura cinerea*, Walker, burst from a cocoon that had been sent to me by a friend. This cocoon had been cut out from the boll of a poplar. It seemed to be formed of very fine woody particles cemented together into a case so hard that one might wonder how the insect could break from it. Examination showed that at the point of rupture the case was very thin. Besides *C. cinerea* I have taken, in Quebec province, *C. borealis*, Boisd., *C. scolopendrina*, Bdv., and *C. multiscripta*, Riley, the last named at Cowansville.

On the 15th June I saw several specimens of that handsome beetle *Rhopalopus sanguinicollis*, Horn, escaping from their tunnels in the stem of a red plum tree. They left oval openings large enough to allow of the insertion of a medium-sized goose-quill.

On the 24th of July I found full-grown larvæ of *Zarea Americana*, Cresson, feeding upon buck-bean, *Menyanthes trifoliata*, L. I find this species every season in the same spot, and only in that spot. The larva has the habit of curling itself round with the head on the outside. The following is a description of it:—Head black and shining, a lighter shade just above the mandibles. Eyes protuberent, glossy black. The back of the larva is lead colour, inclining to blue. The second segment near the head and the anal segment are paler. Along the back are eleven cross-bars, formed of a central black spot with an oblong patch of yellow on either side, terminated on either side with another black spot. Between every pair of these bars are two cross lines of smaller black and *pale* yellow dots. Along the edge of the lead colour on either side is a row of eleven conspicuous black dots. Below it is a broad yellowish-white spiracular line. The spiracles are small and black. Underneath them is a row of deep yellow warts each surmounted with two black dots. On the underside the larva is yellowish-white. The true legs are tipped with black.

I do not know the larvæ of *Abia Kennicotti*, Norton. There are two specimens of the fly in the Provencher collection. The differences between the imago of this species and that of *Z. Americana* are these: Kennicotti is smaller than Americana. Its colour is black with a tinge of green, whilst that of Americana is brown with a tinge of fuscous. Kennicotti has a distinct mark like a reversed Y, extending from the costa to the inner margin of the fore-wing. In Americana this wing mark is confused. The costal line and the venation of the fore-wings in Americana are heavier and more distinct than those of Kennicotti. The abdomen in Americana is somewhat spatulate; in Kennicotti it is rounded. The underside of the abdomen in Kennicotti is black; in Americana it is fuscous.

During the month of August pressing duties and frequent journeys hindered me from giving attention to entomological pursuits. This was unfortunate, for in one of my times of absence I lost a brood of young larvæ of *Hepialus argenteomaculatus*, Harris, which had come from eggs sent me by Mr. A. F. Winn. These eggs were round and black, and under the microscope resembled grapes. In the hatching they were ruptured irregularly. The young larvæ appeared in the last week of August. They were one-tenth of an inch long. The head was disproportionately large—suggestive of a boring habit. It was brown, and there was a brown shield on the second segment. The body was yellowish-white, warty, and set with long hairs. The fore-legs were brown.

In September may be found in the leaves of the Golden Rod (*Solidago Canadensis, L.*) eye-like spots, yellow in the centre with a surrounding of reddish brown. Osten Sacken made a guess at the insect producing these, and named it *Cecydomyia carbonifera*, from the black substance, not unlike charcoal that is found in the galls. For several years I endeavored to raise the fly without success—I think for the reason that I did not collect the blistered leaves early enough. I am under the impression that the larvæ of the fly abandon the leaves, and undergo the pupal change in the herbage or the soil. The parasites of the species remain in the leaves. I raised two kinds of these in abundance, viz.: *Torymus Sackenii*, Ashmead and *Polygnotus solidaginis*, Ashmead. The first named, as seen under the microscope, is a marvel of grim beauty—a polished gem, glowing with crimson, green and gold. The latter is of more sober hue. It is admirably described by Mr. Ashmead in his monograph of the Proctotrypidæ, p. 307. The cocoons of the species may be found in the blisters, three or four in a cluster.

This year I think I have succeeded in raising the original cause of the gall. It is a *Sciara* closely allied to *S ocellaris*, Coms. The following is a description of it: Expanse of wings, two-tenths of an inch; length of body, one-tenth; length of antennæ, one-twentieth. Hairy, of a uniform light brown; head rather small; eyes reniform; antennæ, 14 jointed; mouth organs large; thorax large, rotund; abdomen long, attenuated; wings rather dusky—a peculiar loop in the venation; halteres, club-shaped.

While speaking of Hymenopterous parasites, I should like to express my admiration for the work among the Hymenoptera that is done at Washington by Mr. Howard and his *confreres*.

Mr. Howard's bulletin on the Joint-worm Flies, for its grasp of the subject, its clearness of description, and the beauty of its illustrations is a model work. Mr. Marlatt's NEMATINÆ is also first-class—excellent in every way. Of Mr. Ashmead's PROCTOTRYPIDÆ I can say, that the more I study it, the more I marvel at the amount of care and research that it betokens. It is a very mine of information.

I have said above that I wanted to obtain wasps' nests for a special purpose. Sometimes wasps' nests are plentiful enough. This season there has been a scarcity of them, from the nests of *Vespa maculata*, Fab. downwards.

Here is a story of a wasp's nest: Two Irishmen were working in the woods one day. One called to the other, "Pat, here's a bees' nest in a blather, let us take the honey!" "And sure," said Pat, telling the story afterwards, "there was more cry than honey; and the cry was from Terence."

A short time since I was at a village in the eastern townships; and a farmer I there called upon reminded me of a circumstance that occurred thirty years ago. At that time I was on a visit to a friend for whom this man was then gardener. He was troubled about a colony of wasps that had suspended their nest in the centre of the ceiling of the carriage-house. He was "afraid to burn it, and afraid to crush it." What could he do? "Meet me at night-fall," I said "with a pair of steps and a lantern; and I will take it for you." At the time appointed I went, taking a cork, and a small bottle of chloroform in my pocket. I placed the steps under the nest, whilst the gardener held the lantern at a respectful distance. Having mounted the steps I deftly slipt the cork into the hole at the bottom of the nest, and then poured a teaspoonful of chloroform upon the top of the insect habitation. It immediately soaked through the paper covering; and then there was a great commotion within; but in a few moments all was still I cut the nest from the ceiling with my pen-knife and brought it down in my hand. "Well," said the gardener, "that was neatly done!" And he has remembered all these years *the way to take a wasps' nest.*

On the 10th of this month I went to the St. Henri woods. *Colias Philodice*, Gdt. and *Chrysophanus Americana*, D' Urban, were on the wing. Besides them a few locusts and crickets, two noctuids out of reach, a two-winged fly (*Sericomyia militaris*, Walker), and a beetle (*Necrophorus tomentosus*, Web.) were all the perfect insects I saw.

I found larvæ of *Aulax nabali*, Brodie, in the stalks of the Wild Lettuce, *Nabalus altissimus*, Hooker, a foot, or so, from the ground. They were feeding in the white, downy lining of the stalk, and in some instances had commenced their cells or cocoons which as the stalk dries up will stand out in the hollow like bulblets, the size and shape of grains of hemp. Some years ago I exhibited cocoons of the species at one of our meetings. The perfect insects came from them early in the year following.

I have taken many a walk and examined many a tamarack in the hope of finding cocoons of *Platysamia Columbia*, Smith, a species that was taken at Quebec by Mr. Bowles. Some years ago I found a vacated cocoon of the species. I greatly fear that *Nematus Erichsonii* by stripping its food trees has banished this fine species from the locality.

SOME INSECTIVOROUS MAMMALS.

By Robert Elliott, Plover Mills.

Under the above heading I would like to treat in a popular way of a group of animals which, on account of their food habits, have a more or less direct bearing on the science of economic entomology.

Three orders—namely, *Cheiroptera* (Bats), *Insectivora* (Moles and Shrews) and *Carnivora*, represented by such non-typical forms as the Raccoon and the Skunk—include all of our own species which deserve the apellation "insectivorous mammal."

Unfortunately the term "insectivorous" as applied to a bird or a mammal seems to imply that the food of the species in question is in some way necessarily confined to what we call injurious insects. As a matter of fact little or no discrimination between beneficial and injurious insects has been ascertained as being made by any of our mammals in the choice of their food.

A skunk, foraging through the damp and shady wood, will, on finding one, munch a golden Calosoma with the same avidity that it crushes a May beetle. Most of our terrestrial insects, good and bad as we classify them, are no doubt held to be invariably good by the hungry shrew lucky enough to capture them. From the bat point of view, the *raison d' être* of night flying insects is quite likely enough considered simply as an essential requirement in order to keep the old and exclusive bat family in its proper position at the head of all living things. Nevertheless much good may be done without conscious discrimination; the farmer may derive a benefit from an act performed by a creature not dreaming of his existence. If it can be shown that the despised bat, the misunderstood shrew and the persecuted mole, from an economic point of view, "do good by stealth and blush to find it fame," it may be accepted as sufficient justification for the appearance of this paper in the pages of an entomological report.

The Bats.

The Bats, as an order, are very distinct from any other mammalian group. The most casual observer recognizes these uncanny-looking noctural swallows as simply *flying mammals*, and thus far no other mammals than bats have been found adapted for true flight.

Their relationship to other groups has never been clearly elucidated. No scientific explanation of their origin is afforded by the investigation of their fossil remains. In short any fossil hitherto discovered has been either all bat or no bat at all. While they are thus easily separated from all other groups, when we come to the consideration of how many species we have, the greatest difficulties are at once encountered.

In previous reports of this Society our able Curator, Mr. Moffat, has put with force the pertinent query, "What constitutes a species?"

That this question presses with peculiar force on any one attempting the classification of our bats is admitted by that eminent authority, Dr. Harrison Allen, from whose monograph—"The Bats of North America"—I quote, "The difficulties acknowledged in identifying the American species (*Vespertilio*) are apparently innumerable, so great is the range of variation in the proportions of the ears, thumbs, feet, tail and phalanges of the manus and in the coloration of the fur and the membranes. If the purposes of zoological science should end with the identification of species, the student might well be discouraged in his studies in this field. But, fortunately, the very intricacies of the subject suggest problems in the attempts to solve which his knowledge of the life and structure of these little organisms cannot fail to be increased."

Owing to the courtesy of W. E. Saunders, Esq., I have had the opportunity of making an extended study of a series of bats collected by him, chiefly in the vicinity of London. As I feel quite unable with the space at my disposal to give a non-technical description that would prove of practical value, I simply give a list of species with short notes on their distribution, etc.

All our species belong to the family *Vespertilionidæ*, are pre-eminently insectivorous and apparently hold the same relation to the night-flying insects that our swallows do to those insects which fly by day.

1. *Vespertilio gryphus* (Fr. Cuvier), The Little Brown Bat. Five specimens. One of our commonest species, ranging in different forms from the north-eastern United States to Hudson Bay, and west to the Rocky Mountains. Pastoral in local distribution as contrasted with the more urban Brown Bat.

2 *Lasionycteris noctivagans* (Leconte), The Silvery Bat. Four specimens. Common throughout North America. Partial to waterways and known to be a good swimmer.

3. *Adelonycteris fuscus* (Palisot de Beauvois), The Brown Bat. Five specimens. Perhaps the commonest species in the more settled parts of the country. Of wide range.

Fig. 1 Shows a Red Bat hanging by hind feet. Natural size.

4. *Atalapha noveboracensis* (Ecxleben), The Red Bat. Five specimens, three adult and two young. Our most brilliantly coloured species. Habitat, North America at large, excepting the coldest regions.

5. *Atalapha cinerea* (Palisot de Beauvois), The Hoary Bat. Two specimens. Our largest bat. Habitat, Northern regions, occuring southward only at high altitudes. The capture of two specimens at London must be considered highly interesting to the student of zoo-geography.

Of the twenty-eight species treated by Dr. Allen as North American, the five given above seem to be all that have as yet been found in Ontario.

Vesperugo carolinensis (Geoff), The Carolina Bat. Ranging from Massachusetts and Pennsylvania southward, will possibly be found in Ontario.

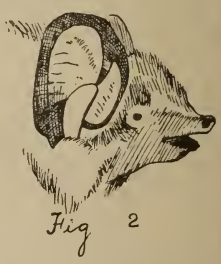

Fig. 2. Profile of head of same. Natural size.

Upwards of 400 species are known in the world. In the tropics large fruit-eating forms are abundant. Those of temperate regions, as ours, are almost exclusively insectivorous and as such must, generally speaking, be considered beneficial.

Occasionally bats find shelter in badly constructed dwellings. There they congregate each morning in increasing numbers and finally, with much chattering and quarrelling they sink into their long hybernatory sleep.

In some cases the owner of the house, after different attempts to smoke them out with sulphur, is often driven to tearing off boards, and after considerable trouble and expense, gets rid of a colony of one hundred or more.

The most curious zoological fiction connected with bats is the absurd belief that they are the offspring of bed-bugs. Once a wise-acre of our country-side gravely advanced to me this untenable theory of the origin of bats. While admitting that owing to the similarity of their retreats bats might transfer the "bugs" to new quarters, I combatted as best I could the ridiculous statement by showing that it was a wholly unnecessary assumption. But lo! he, as if to demonstrate that "there are more things in heaven and earth than are dreamt of in our philosophy," challenged me to deny that *gorillas* had crossed over from Africa and had taken an effective part with Wellington in the Peninsular campaign against the French. In vain I defined the term "guerilla warfare"—he, forsooth, was a captain of our Canadian volunteers, and not wishing to have exemplified on myself his conception of a "gorilla attack," I escaped the dilemma with the diplomatic rejoinder that one story seemed as true as the other.

The Moles and Shrews.

While we have here to treat of (scientifically speaking) a very different order from the bats, from an economic point of view their similarity is well shown by a quotation from Carl Vogt: "One may, indeed, say with truth that they continue on and under the earth, yes, and even in the water the persistent hunt for insects, snails and all possible vermin, begun by the bats in the air."

The insectivora is a large order of mostly small mammals, forming one of the primitive types of their class. Two families—Talpidæ (moles) and Soricidæ (shrews)—are well represented in the fauna of Ontario. While externally these animals simulate the appear-

ance of mice, they are in internal structure widely different. The rodent type of teeth as illustrated by the common meadow-mouse, or *vole* (Arvicola riparius), whose sharp, chisel-shaped incisors and flat-topped molars are admirably adapted to the gnawing and grinding of the farmer's grain and roots, is replaced in the moles and shrews by a totally different dentition. Here we have projecting incisors, mostly one pair, canines, pre-molars with pointed crowns and (usually) trifid molars—a machine well fitted for the capture of terrestrial insects, whose hard elytra are crushed with a facility truly surprising.

That the distinction between a *shrew* and a *mouse* is not more clearly known is a decided misfortune to both the farmer and the shrew. Meadow-mice feed on the farmer's crops and are generally treated as they truly are—that is, unmitigated pests. Shrews feed on insects and (in the case of one species, at least) on those very mice the farmer so cordially dislikes. Yet to the average farmer every little furry creature that runs through his fields is merely a mouse, nay even worse than that, if any distinction is made at all, it is usually against the poor little "screw mouse"—an unreasonable prejudice allied to superstition. I have seen a farmer really afraid of a tiny shrew as it darted hither and thither with amazing rapidity in its frantic efforts to escape. To one of such I told, with a touch of irony, a curious superstition held by the Eskimo of Norton Sound, as related by Mr. Nelson in his "Natural History of Alaska."

"Those Indians claim that there is a kind of water-shrew living on the ice at sea which is exactly like the common land shrew in appearance, but which is endowed with demoniac quickness and power to work harm. If one of them is disturbed by a person it darts at the intruder, and burrowing under the skin, works about inside at random and finally enters the heart and kills him. As a consequence of this belief the hunters are in mortal terror if they chance to meet a shrew on the ice at sea, and in one case that I know of a hunter stood immovable on the ice for several hours until a shrew he happened to meet disappeared from sight, whereupon he hurried home, and his friends all agreed that he had had a very narrow escape."

The moles are completely fossorial in their habits, and possess in a high degree the traditional pugnacity of all miners. One meeting by chance a rival above ground, fights with a fierceness that carried on in proportion by large animals would be really terrific.

The earth worm forms the staple food of moles, and as this worm is accounted an important factor in the formation and improvement of soils, the mole must, to that extent, be considered an injury to the agriculturist.

The disfigurement of lawns and gardens by the large quantities of soil thrown up by even a single mole in a night is a serious charge, more applicable, however, to the English mole than to any of ours. The still more serious indictment that our common mole eats the roots of vegetable and other garden plants is likely enough a slander. A mole in a garden burrows along a row of plants in order to procure the numerous grubs and insects which congregate in just such places. Later a *vole* (meadow-mouse), entering the tunnel, finds ready access to its favorite article of diet—the roots of garden vegetables. There is the mole's tunnel—there are the potatoes eaten—and so the mole is condemned.

The Ontario species are three in number.

1. *Condylura cristata* (Linn).—Star-nosed Mole.—A most unique species, owing its

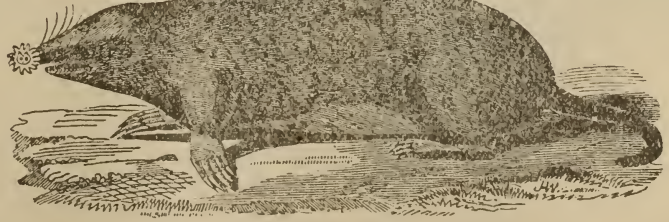

Fig. 3. The Star-nosed Mole (reduced.)

name to about a score of radiating cartilaginous processes on the nose. Partial to moist situations, and so far as my own observations go, our commonest species. Fig. 3 (reduced).

2. *Scalops aquaticus* (Linn).—SHREW MOLE.—The term *aquaticus* as applied to this species is a misnomer, as in its habits it shows a preference for the drier ground, coming frequently into gardens and being of doubtful utility there. Apparently rare in Ontario.

3 *Scapanus Americanus* (Bartram).—HAIRY TAILED MOLE, BREWER'S MOLE —More northern than either of preceding. In habits resembles the shrew mole. One taken at Ottawa, as reported by Ottawa Field Naturalists' Club, 1890.

The shrews are much more terrestrial than the moles, and are still more mouse-like in their appearance. However, their long, pointed and movable muzzle should serve to distinguish them from mice. Their position in the economy of nature is, as has been pointed out, vastly different. They feed on insects the year round, and are nocturnal in their habits. They are all small, some exceedingly small, the Etruscan shrew, found in Italy, being the smallest of known mammals. Its head and body measure only an inch and a half in length, and its tail adds about an inch more.

What shrews lack in size they atone for in numbers, activity and voracity, and from an economic point of view they must be reckoned among the farmer's best friends. Two genera and several species occur in Ontario.

1.—*Blarina brevicauda* (Say.) SHORT TAILED SHREW. More mole-like in appearance than any member of the next genus. Besides destroying innumerable injurious insects in the course of a year, this industrious mammal is a persistent enemy to mice, following them into their burrows and killing them there. Common in Ontario.

2.—*Sorex Cooperi*, Bachman —COOPER'S SHREW. This little dweller of our fields and woods is by no means so rare as its infrequent capture would lead one to suppose. While it moves in its agile, restless manner usually on the surface of the ground, it manages to travel under cover of dead leaves and herbage, thus eluding the notice of all but the keenest observer. Once in the woods about the middle of May, searching for salamanders, under rotten logs, etc., I captured alive a specimen of this diminutive shrew which I had disturbed and driven from his sylvan retreat. Placing it in a large bottle with a handful of cotton batting, I watched it dart through and through the cotton with astonishing rapidity. Half an hour later I introduced a live May beetle which was instantly attacked and entirely eaten. Within ten minutes I proffered an earth-worm which was immediately caught at the head and bitten down the middle throughout its whole length. The action although quickly performed left a groove or cut as neatly as any dissector could have done with a knife. The worm at once collapsed and from its whiteness I inferred that its blood had been extracted during the nipping process. As it remained untouched, within another ten minutes, wishing to know whether the shrew's appetite had been satisfied or whether it preferred insects to worms, I dropped in a second May beetle which was at once killed and the major portion eaten, the head and elytra alone remaining. Shortly afterwards the voracious little creature died, overcome as it seemed by the very abundance of supplies —a death suggesting, though somewhat dissimilar from, that of the farmer who, according to the Porter in "Macbeth," "hanged himself on the expectation of plenty."

Fig. 4. SOREX ARANEUS.—A Typical Shrew.

3.—*Sorex platyrhinus* (De Kay) BROAD-NOSED SHREW. In August, 1895, I captured in a field of reaped oats near Plover Mills, an individual of this species which as far as I know remains the only record for Ontario. In habits it differs in no marked degree from its congener, Cooper's Shrew. Fig. 4.—The common European Shrew (*Sorex araneus*)—a typical representative of the large and useful genus, Sorex. Natural size.

The Raccoon (*Procyon lotor.*)

While the Raccoon is perhaps the most omnivorous of all our mammals, eating with avidity birds and their eggs, frogs, fish, cray-fish, nuts, fruits, corn and sometimes poultry, yet before framing an indictment against him we should give him fair credit for large numbers of insects and mice destroyed in the course of a season.

I have examined the stomachs of many 'coons killed during the time the corn was in the milky stage, and have nearly always found more insects than anything else, notably the red-legged locust, in seasons when that pest was most destructive.

The Skunk (*Mephitis mephitica*).

In the face of the unsavoury reputation with which common report invests the Skunk—a reputation partly acquired from an *occasional* raid on the poultry yard to kill chickens or to suck eggs, and partly by reason of his defensive and offensive odour, it is pleasant to quote from Dr. Merriam, the highest authority on North American mammals, the following testimonial as to his sterling qualities: "Of all our native mammals perhaps no one is so universally abused, and has so many unpleasant things said about it, as the innocent subject of the present biography, and yet no other species is half so valuable to the farmer. Pre-eminently an insect-eater, he destroys more beetles, grass-hoppers and the like than all our other mammals put together, and in addition to these devours vast numbers of mice."

In discussing this interesting paper, Mr. Fyles asked whether it were correct that a noticeable difference between a mouse and a shrew was that a cat would not eat a shrew, because it was carnivorous and therefore not suitable for food.

Mr. Saunders said that this was probably not because the shrew is carnivorous, but because it had a peculiar and unpleasant odour, derived from a sack or gland, and that this caused cats, hawks and owls to prefer other mammals. He then exhibited a series of skins of bats, and gave a brief account of each species.

Dr. Bethune, in commenting on the usefulness of skunks, mentioned the benefit they confer upon hop-growers by destroying the larva of a moth, *Gortyna immanis*, which is often very injurious to the plants. This caterpillar eats into the crown of the root and if unmolested gradually burrows through and causes the death of the whole plant. In the hop-yards in the northern part of the State of New York it is related that the owners encourage the presence of skunks and do not allow them to be molested. These animals prowl about the yard and by listening at the foot of a hop-plant discover whether there is a worm gnawing at the root; if so they speedily dig away the earth and extract and devour the worm. It only remains then for the grower to replace the earth and thank his unsavoury friend for the benefit that he has conferred in saving the life of the plant. This injurious insect the speaker had found very abundant some years ago in a large hop-yard at Erindale, near Springfield-on-the-Credit.

Mr. Fyles then exhibited a fine collection of insects recently taken in Barbados, West India Islands, by his son. After the inspection of these and other specimens that were brought by the members present, the meeting adjourned.

EVENING SESSION.

In the evening the Society held a public meeting in its rooms in Victoria Hall, at which there was a largely increased attendance of members, between thirty and forty being present. The chair was taken by the President, Mr. Dearness, at 8 o'clock. After explaining the much regretted absence of Dr. Fletcher, who was unavoidably prevented from attending, he proceeded to deliver the annual address, which he illustrated with specimens and drawings on the blackboard, and also with photographs, and which was listened to with great interest and attention.

ANNUAL ADDRESS OF THE PRESIDENT.

By J. Dearness, London.

Friends and Members of the Entomological Society of Ontario :

I have the honor this evening to welcome you to the thirty-fourth annual meeting of the Society. By name, at least, I know of five other similar Societies on this continent : the American, the Cambridge, the Newark, the New York, and the Washington. The organization of only one of these, the first named, antedates that of our own Society.

The thirty-fourth annual meeting! To the younger members, who, but for a year or two have been witnesses of the work done in these rooms, and who have been reading the reports and the monthly issues of the *Canadian Entomologist*, it may be worth while to say that there is evidence that each and every one of these thirty-four years has been characterized by energy, progress and success, one almost equally with every other from the first until now.

The evidence is not far to seek, in fact we are overwhelmed with it. These shelves, stocked with reports and volumes, filling two sides of the room, tiers of drawers and cases of specimens, classified and catalogued, crowd us so that we scarcely have room for our chairs. Very material evidence this, even on the surface, that busy men founded this society and labored to promote its interests. In doing this great work two objects or purposes conspicuously inspired them—devotion to science for its own sake, and the desire to discover and disseminate knowledge for the sake of their fellow-men. No other incentive seems to have had any existence in their minds.

On the eve of removing from these rooms, where so much of the society's work has been done, to more commodious and convenient quarters, it seems opportune to turn our thoughts to the labors of the Society's veterans. We younger members cannot over-appreciate the rich heritage left us by these pioneers, and we should be stimulated by the contemplation of it to prepare ourselves to carry on the work in the spirit and enterprise of the example they have set us. The events of the year give emphasis to this statement. I presume only one person here can recollect attending an annual meeting before this one from which our beloved friend, the late Mr. Denton, was absent. His kindly voice, and that of another officer of this society, Capt. Gamble Geddes, of Toronto, have lately been hushed in death. The thought of their passing and leaving the work here which they had so much at heart suggests the desirability of the Society's compiling a memorial album, with portraits and sketch of its founders and its most earnest and useful workers.

A moment ago I said, "only one person here." I need not name him, as you all know it must mean the venerable editor of the *Entomologist*, Dr. Bethune, of Port Hope. Was he not at the inception of the society thirty-four years ago (in fact he and Dr. William Saunders, now director of the Dominion Experiment Stations, were its parents in every sense), and has he not attended nearly every annual meeting since its inception? May that one be many a year distant when he shall cease to be present; I can hardly conceive what one would be like without him and Dr. Fletcher and the Rev. Mr. Fyles. And although they all seem good for many years to come, yet you younger members must prepare to take their places sometime. I trust that even now you are observing, studying, reading—equipping to sustain and extend the good work so successfully begun.

Much has been accomplished, a very considerable library has been founded, much valuable material has been accumulated, a fairly complete taxonomy of the important insects of Canada and the neighboring States, has been placed on exhibition, and thus a foundation has been well laid that will enable future workers to specialize and to engage in practical studies with definite purpose.

Some Injurious Insects.

It has been usual for the President, in his annual address, to present an economic entomological survey of the province. My field of observation has been limited to the six or seven townships around London.

Last year our Curator, Mr. Moffatt, reported the prevalence of the cut-worm moth, *Hadena Arctica* (Fig. 5) Householders in town and country remember the nightly dance of these moths around the lamps and their soiling of curtains and clothes during the day. This spring I noticed many a patch of spring grain that had been sown on plowed sod so badly eaten that the ground was plowed again and sown with peas or otherwise used. The farmers said the wire-worms are at work, but in any plot I examined it was no trouble to discover the greenish-yellow cut worm, the larvæ of the *Hadena*. Would rolling the affected part of the field at night with a heavy roller across the drills destroy enough of these larvæ to save the crop? I should like to hear the point discussed whether we may expect another invasion of our homes by this moth next year, such as Mr. Moffat described in the last report. I did not find any specimens that seemed to be parasitized.

The grasshopper or locust (*Melanoplus femur-rubrum*, De Geer, Fig. 6) was not nearly so injurious as in 1895. Its partial disappearance is probably mainly due to the increase of its parasite, the red mite, *Astoma* (Fig. 7).* The spring was favorable for the development of the grasshopper, and in some localities it was present in prodigious

Fig. 5.

b

Fig. 6.

Fig. 7.

numbers. I never saw them more numerous or vigorous than on the 18th of June along a side road between Con. vii. and viii. of McGillivray. Two or three miles on either side of this locality but few were to be seen. Where they were numerous I did not find one parasitized specimen; where they were scarce but few had not the red mites adhering to them under the wings.

In a few limited areas of the country the army-worm, *Leucania unipuncta*, appeared in countless numbers and destroyed or greatly damaged oats, barley and corn. In early September the imagines were abundant everywhere in the range I travel. With the moths so numerous and generally distributed one would naturally expect the insect to be destructive next year. If such expectation is fortunately not realized, the interesting question arises—what influences have checked it? Is the multiplication of the Tachina fly so rapid as to prevent its appearance in destructive numbers the second year in the same district?

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* Dr. James Fletcher, of Ottawa, writes that the prevailing opinion of arachnologists is that the *Astoma* (or *Atoma*) is the larval form of *Trombidium*, and that in Henshaw's Bibliography of Economic Entomology *Astoma gryllarium* is given as synonymous with *Trombidium locustarum*. Further references are Andrew Murray's "Aptera," pp. 128-129; Riley's "Rocky Mountain Locust," pp. 128-130; Lintner's Eighth Report, 1891, page 180; First Annual Report United States Entomological Commission, pp. 306-311. As a rule the six-legged mites are the larval forms.

The Fall web-worm, *Hyphantria textor*, has been very common in this county. I know two localities where every black ash—of which there was a considerable number of trees—was completely defoliated. Not a vestige of leaf was left. The trees were literally enwebbed from the top to the root. Seizing the webby fabric on the trunk it could be pulled off in strips reaching to the lower branches.

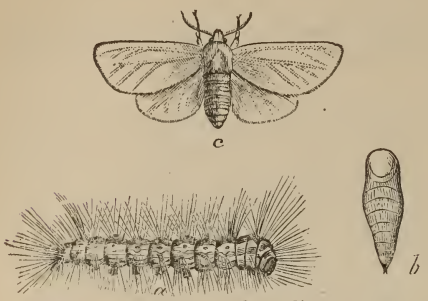

Fig. 8. *a*, worm; *b*, chrysalis; *c*, moth.

The orchard fruits in this country have been unusually free from insect injury. In 1895 fruit was a failure, owing to the heavy frost late in May. Its scarcity caused every apple that escaped to be gathered carefully. None was allowed to remain on the ground. This year all wormy fruit, and indeed much that is not wormy, is left to rot, so abundant is the crop and so insignificant the price for it. Hence the insects will develop without let or hindrance, save from their natural enemies. The abundance of this year's crop points to increased need for spraying next year.

Failure of Pea Crop.

It would be out of place here to speak of fungal and bacterial injuries to crops, etc., to which I give more attention than to insects, but I may refer to the failure of the pea crop in Prince Edward County. Some farmers there find it profitable to raise garden pease for sale to the seedsmen. This year the crop failed; the diseased plants looked as though they were affected by a parasitic fungus. Mr. Craig, the Dominion Horticulturist, kindly sent me a large number of specimens. On many of them I found fungi, all probably saprophytic, not disease producing, but produced in the diseased or dying tissue, and, what is more noteworthy, on many, in fact nearly all the roots I examined, a minute Nematode or Anguillula-like worm. There were not any nodules such as the rose anguillula produces on the roots of that plant in the green-house. Much damage is done to plants in the Southern States by anguillulæ, but it has been thought that the winters in our latitude are too severe for any organism of this class to survive in injurious numbers. The failure of the pea crop in that county needs further investigation. I believe it was due to several causes, one of which was the presence of these nematodes.

Parasitic Fungi.

Speaking of fungi naturally leads one to think of the work done in a new and im-important field, that of artificially controlling injurious insects by vegetable parasitism. Colonies of silk-worm and of the honey bee are occasionally devastated by a muscardine and pebrine and foul-brood respectively, which are fungal and bacterial parasites. It is not unreasonable to suppose that similar parasites may be discovered capable of artificial cultivation which may be introduced among gregarious insects as grasshoppers, army-worm, etc., and used to control them effectively. Prof. Forbes, of Illinois, has experimented extensively upon inoculations of the Chinch bug.

Laboratory experiments have been conducted in Cornell Agricultural Experiment Station by Mr. R. H. Pettit, under the direction of Professor Atkinson, with various parasitic fungi upon several different kinds of insects. Dr. Roland Thaxter has done plendid work on the *Entomophthoreæ*. Prof. Snow, of Kansas, Prof. Webster, of Ohio, and others, have also labored in the same field. So far, while many of the laboratory experiments have been successful and promising, the work in the field has not yet, to my knowledge, reached very satisfactory results.*

* Since writing the above I am informed by Dr. Bethune that at the Buffalo meeting of the Economic Entomologists, August, 1896, Prof. Webster, of Wooster, Ohio, stated that farmers in the districts of that State badly infested with the chinch-bug had eagerly obtained and used specimens of the pest artificially inoculated with *Sporotrichum* to distribute where chinch-bugs would come in contact with them, and thereby contract and spread the disease. He reported satisfactory and encouraging results.

The subject of entomogenous fungi is too large to enter on here, but it may be of interest to show specimens of a few of those most commonly met with.

The first is a parasite on the scale insect (*Lecanium* sp.), which I find on oak, ash, and blue beech. It is called *Cordyceps clavulata* (Schw) ; the genus is in the same order with the medicinal ergot or smut of rye. The fungus feeds upon the tissue of the insect, displacing the latter by its vegetative portion. It matures by producing erect sporophores, $\frac{1}{8}$ to $\frac{1}{4}$ inch long, bearing papillate conical heads. Under each papilla is embedded a perithecium containing numerous sacs or pods called asci, each of these sacs contains eight long, separate sporidia or "seeds."

Fig. 9.

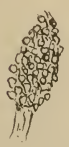

Fig. 10.

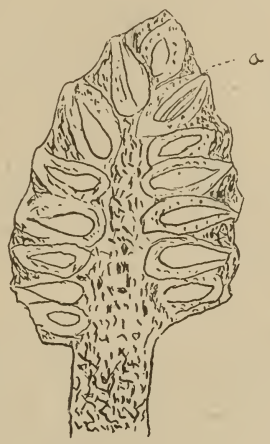

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 9.—Twig with two scale insects. One of them killed by *Cordyceps clavulata*, having three sporophores of the fungus.

Fig. 10.—Head of one of the sporophores enlarged.

Fig. 11.—Cross-section of head of sporophore showing the flask-like perithecia greatly enlarged. These perithecia are filled with sacs as indicated at *a*.

Fig. 12.—A sac or ascus containing eight sporidia still more highly enlarged.

Fig. 13.—A sporidium or "seed" magnified 750 diameters.

The fly-fungus, *Empusa muscæ*, Cohn, belongs to a very different group of fungi. The former is placed in the class with black-knot of the plum tree and the mould on the gooseberry. This has close relationship to the white mildew of the grape, to the peronospora which produces soft rot of the potato, and to that causing a peculiar stinking decomposition of fish. No doubt you have observed dead flies surrounded by a whitish halo adhering to a pane of glass. This halo consists of the spores, conidia—and secondary spores thrown off by the growing fungus from the body of the infected fly.

When one of these living spores gets attached to the under side of a fly's abdomen, it puts out a tube which penetrates the skin and rapidly spreads through the whole body in the manner in which yeast grows through bread, feeding upon the fatty substances within the fly. The exhausted fly finally settles, it may be on a pane of glass, there the fungus by abjunction scatters its spores around the body producing that smoky halo to which I referred.

Dr. Roland Thaxter in his masterly monograph on the Entomophthoreæ in which he describes the various known species which affect flies, mosquitoes, gnats, aphides, cicadæ, thrips and lepidopteræ, says of the house-fly fungus that its occurrence out of doors is an exceptional phenomenon, and that he knew of only two instances. His observation makes the specimens I have laid on the table the more interesting, as they were collected

off leaves and twigs near the edge of Cranberry Lake, in the County of Oxford. (A box containing twenty or thirty olive-colored flies killed by this fungus was passed round for examination.)

Fig. 14. Fig 15.

Fig 17.

Fig 18.

Figs. 14 and 16.—Conidiophores forming white rings between the segments of the abdomen. Highly enlarged.

Figs. 15 and 17.—Primary and secondary conidia which form the smoky halo seen round the fly adhering to the pane of glass. Highly enlarged.

Fig. 18.—Conidiophores of *Isaria farinosa* slightly enlarged.

Another fungus, or stage of a fungus, doubtless quite common though not frequently observed, bears the name *Isaria*. These specimens which I have here grew upon pupæ, probably of Arctiids, and are labeled *Isaria farinosa*, Fr. They are supposed to be a stage of *Cordyceps*. Out of the insect grew these conspicuous sporophores, $\frac{1}{4}$ to $\frac{1}{2}$ inch long, orange at base but covered when fresh for two-thirds of their upper part by a white dusty layer of spores which arise from the ends of the threads forming the sporophore. At Cornell, spores from a potato culture of this fungus were painted on the ventral side of seven "woolly-bear" caterpillars; in twenty days the fungus had attacked all but two of them, and in another month one of them had developed showy sporophores like that from which the culture had been taken.

Fig. 19.

Fig. 20.

Fig. 19.—A thread of *Sporotrichum globuliferum* bearing spores greatly enlarged.

Fig. 20.—A thread of Isaria bearing spores separated from the compact sporophore. Greatly enlarged.

The fungus which has been used for infection experiments with the chinch-bug is known as *Sporotrichum globuliferum*. It was first found on Carabidæ and is somewhat like Isaria in its method of growth. Instead of the filaments being compacted into sporophores they envelop their hosts in a loose white cottony swathing. (An example of sporotrichum on a beetle was exhibited, also larvæ bearing *Isaria*).

Entomological Literature.

The President's addresses have usually presented a brief review of the entomological literature of the year. That duty will be discharged this time by Dr. Bethune. I have just a word in reference to two publications that have recently come to these rooms—one, a report of the Gypsy Moth Commission prepared by Drs. Forbush and Fernald,—a volume of over 600 interesting pages, devoted to one injurious insect. I refer to this to show what labor may be involved in studying and combatting even one insect. The labors of the Massachusetts entomologists in controlling the spread of the gypsy moth are a monument to the value of economic entomology.

The other publication to which I refer is a bulletin called "Practical Entomology" by Messrs. Hopkins and Rumsey of the West Virginia Agricultural Experiment Station. It is a veritable *multum in parvo* and although it contains only about 80 pages it keys and classifies the insects injurious to farm and garden crops in a very unique manner. The most inexpert farmer or gardener is led directly to a pretty certain identification of his insect foes and the approved remedies are briefly indicated. I wrote a letter to the authors complimenting them upon their plan of presenting practical entomology to the agriculturist. Director Myers acknowledged the letter and stated that it is their intention to continue this line of practical instruction to the horticultural and other interests and probably finally to publish the work in book form.

Teaching Natural History in Schools.

On every occasion that has offered the opportunity, I have put in a plea for such modification of our school curriculum of studies as would provide for the education of the observing faculties of our children. Training to observe facts, and to relate causes and effects not only affords good mental discipline but is of the highest practical value. We must all to a greater or less extent be experimenters throughout our active lives; hence skill in observing, comparing, relating and judging is necessary to success. Properly conducted nature-study is therefore of very great value. For the purposes of such study local geography, and the phenomena of weather, plant and insect life, furnish the very best material.

The flower and the insect appeal powerfully to the child's interest and while in botany and entomology there are many problems that the greatest observers and thinkers have not answered, yet there are others that even the little kindergartners find a pleasure in solving when the proper method is pursued. At teachers' meetings and at the Central Farmers' Institute I have outlined a course of study pointing out what might be attempted, especially for the benefit of farmers' children in entomology, etc., in each grade. A few years ago Prof. Wm. Saunders read papers here entitled "Entomology for Beginners." He treated in a popular way the life history of the cabbage butterfly, the leopard moth, the polyphemus, the satellite sphinx, the red humped apple-tree caterpillar and the eyed elater.

We need such papers as those—modified so as to treat in an experimental manner the life history of a half-dozen common typical insects—containing practical suggestions on observing their habits, capturing, caging, feeding, and preserving them. The paper might be issued by this Society as a bulletin. The teacher would find additional assistance in such works as Prof. Panton's "*Insect Foes*" and Packard's *Entomology for Beginners*. Besides the educational value and pleasure to the children of such study consider what important practical bearing it would have. Such mistakes as I knew a gardener to make would not then occur. He killed the tomato sphinx larvæ by stamping on them, but those bearing the coccoons of its parasitic ichneumon he carried to the house to be immersed in boiling water to kill the eggs as he thought. Think of it, ignorantly scalding his best helpers!

Last spring I went to the proper committee of the Western Fair Board with the request that it offer prizes or diplomas to schools for exhibits of the life history of injurious insects. Our thanks are due to the committee for compliance with the request as it has shown what can be done by a teacher and his pupils in this line when he seriously addresses himself to the task. I have the exhibits here from school No. 14, N. Dorchester, and Union 5 and 15 London. The teacher in No. 14, Mr. J. W. Atkinson, had no technical knowledge of insects when he set about this work but taking advantage of the presence of the army worm in his section and following a few written suggestions on technique, he caged the larvæ, reared the moths, secured the eggs, and captured several beetles which prey upon the larvæ. What an object lesson this was to the children? How much more interesting, useful and exact their knowledge of metamorphosis having thus observed it, than if they had merely read the account of it in a book, even in a pretty picture-book. I think the result of this effort is well worth publishing. To that end I have had this photograph of the exhibit taken. See opposite page 32. It does not and cannot show the written sketch and the specimens of barley, oats, corn and mangolds damaged by the larvæ, but it will afford suggestions and stimulation to teachers who may see this report.

The exhibit of the squash-bug showing this injurious insect in seven stages from egg to adult males and female with a biographical sketch and specimens of its work on the pumpkin was prepared under the guidance of one of our young members, Mr. Robert Elliott of Plover Mills, in Un. 5 and 15. (The exhibits, written accounts and mounted specimens of the damaged crops, corn, oats, etc., were passed round.)

The report of the Council outlines the work of the Society for the year. The general verdict on its persual will be "Well done.". The only opinion meant to be adverse which I have ever yet heard upon the work of this Society is that too much attention has been paid to American insects and that our pages have shown too much intercourse with the entomologists of the United States. Congress gives to every State in the Union $15,000 annually to devote to experiment station work. To each of these stations are attached one or more practical entomologists. What a large staff of trained workers this liberal policy must tend to produce. Are we to be blind or indifferent to the wealth of investigation and result these men are accomplishing? The potato beetle, the horn fly, the army worm, have to be combatted—in short which of our injurious insects has not to be combatted by the farmers of the northern United States as energetically as by ourselves, indeed it is usually from and through that country they reach us for unfortunately these insects pay no attention to political boundaries nor customs' officers. I believe the Americans as well as the vast majority of our own people realize that entomologically theirs and ours is one country. The Americans have honored two of our members—Dr. Fletcher and Dr. Bethune by electing them in 1889 and 1893 respectively as president of the entomological section of their chief national science association, President Cook at the Indianapolis meeting in 1890, speaking of "our country" said, "by ours I include, of course, our Canadian brothers for we, as scientists know no line of separation." That sentiment is reciprocated here.

American entomologists cordially work with ours for the common good. I remember Prof. Saunders relating that Prof. Lintner, State Entomologist, Albany, N. Y., had enlisted his co-operation to control the gooseberry saw-fly, *Nematus ventricosus*, by sending him parasitized eggs of that species. This is but an instance that might be multiplied. At a meeting in Brooklyn, N. Y., Mr. L. O. Howard, Chief Entomologist at Washington, after highly complimenting the Rev. Dr. Bethune as a Canadian entomologist testified that—in a large measure due to Dr. Fletcher and to Dr. Saunders—economic entomology had been energetically prosecuted in Canada. "Canada" he says "has the man (Dr. Fletcher) and the knowledge but has been hampered by want of funds. The result is that while she has immediately and intelligently adopted the results of researches made in this country she has not been able to lead us in original investigation."

It is foolish to think of entomological areas being demarked by parallels of latitude or even by rivers and lakes. President Saunders in his address in 1882, declared that although belonging to Ontario and sustained in our work mainly by the liberal aid granted us by the Ontario Government, our sphere of usefulness extends throughout the length and breadth of this great Dominion, and also across the lines into the United States. That declaration is true; we can and do help our cousins across the lines and we are helped in return. The close student of the intercourse knows that we get as much or more than we give.

May our entomologists ever keep a watchful eye on the methods and results of their American confreres and continue to be regarded by them as skilful and helpful co-workers, and worthy in the future as in the past to fill places of honor in their national conventions.

Discussion on the Address.

In rising to move a vote of thanks to the President for his very able and interesting address, Dr. Bethune said that he had been very kind in referring in so complimentary a manner to the founders of the society. Many years ago, Dr. William Saunders and the speaker set to work to gather together all those in this Province who were interested in entomology.. After a meeting had been called, much assistance was given by Messrs. Croft and Hincks, two professors in the University of Toronto, and Dr. Sangster, who was at the head of the Normal School. Thus a beginning was made, and each year was marked by the addition of more members, and by some good work done. One of the early members was our lamented friend, Mr. John Denton, who had passed away since our last annual meeting, and who was esteemed and respected by every one who knew him. We all missed his kindly presence and the genial hospitality with which he always welcomed the members from a distance. He took the deepest interest in the welfare of the society, and by his exertions and wise counsels did much for its perma nent success. The speaker also referred to the loss the society had sustained by the death of Captain Gamble Geddes, who had been an active member for many years and one of the Council representing Toronto Division.

Dr. Bethune then spoke of the great value of the President's researches into the life history of parasitic fungi and the practical advantages that may result from them, and referred to the excellent work that was being done in this respect by scientific men in the United States. He had learnt, with much surprise, that objections had been made to the annual reports of the society on the ground that so much attention and space was given to the proceedings of the American Association of Economic Entomologists. In the first place it should be remombered that this association was originated by Dr. Fletcher, of Ottawa, and was organized and held its first meeting in Toronto; it is therefore as much a Canadian as an American society. Furthermore we must all feel that science has no political, geographical, religious or sectional boundaries; it embraces the whole world, and on this continent we know that, while we can sometimes help our American cousins, we are largely indebted to them every year for valuable additions to our knowledge. We who study entomology are especially aware of this. Many noxious insects have come to us across the frontier, paying no respect to political boundaries or custom-house officers, and we have been prepared for their coming and taught how to receive them on their arrival by the experience and the labours of our friends "on the other side." But for this knowledge we should be in an unhappy plight, and while we were trying experiments and studying out the history of the insect, it would be sweeping unchecked over our fields or fruit trees. Surely it is most important that we should take the earliest opportunity possible of giving to our farmers and fruit-growers the experience that has been gained by the various state entomologists and experimental stations scattered over the continent, and afford them information which they would be unlikely otherwise to obtain.

Mr. Fyles, in seconding the vote of thanks, expressed the great delight with which he had listened to the President's address, especially to the part relating to fungi, which

opened a wide field of great interest, and he felt personally very grateful to the President for giving such a clear account of the growth of fungi and bringing before the meeting matters with which few of them were familiar.

After the vote of thanks had been put to the meeting and pronounced "carried," amid much applause, the President introduced Professor Panton, of the Ontario Agricultural College at Guelph, whose work and labours were, he said, well known to all who are interested in agriculture and entomology. Prof. Panton, who was very warmly received, said he had great pleasure in being present at this annual meeting of the Entomological Society of Ontario. He had done a good deal himself to disseminate the teachings of the society during the last fifteen years, and each year he had been much interested in reading the reports of its proceedings and researches, but till now he had always been prevented from being present at its meetings. He then proceeded to give the following address:

ENTOMOLOGY FOR RURAL SCHOOLS.

By Professor J. Hoyes Panton.

It is a gratifying thing to observe, that within the past few years, there has been a growing desire, on the part of farmers, to know more of the teachings of science, as it bears upon agriculture. It has been the privilege of the writer to attend many Farmers' Institutes since their commencement. At first, any topic of a scientific nature excited but little interest. The great majority cared little to hear about a subject, which seemed entirely of a theoretical nature; and, far removed from the truly practical work of the farm. However, that condition has passed away, and the average farmer now feels, that a knowledge of the teachings of science lies at the very foundation of success in the pursuit of agriculture.

He has learned that science is simply systematized knowledge; that its principles are founded upon the facts which are discovered daily on the farm, or in the orchard. In reality, the farmer is one of the most scientific of men, and is surrounded by conditions especially fitted to develop observation, comparison, and method in work. The Farmers' Institutes have done a great work in awakening farmers to the necessity of a study of science, as it relates to their work. But we believe, a greater future is in store for the people of rural districts, when their children shall have become acquainted with the teachings of science, by giving some attention to its study, while, at the common school, in their neighbourhood. With a view to direct attention to how the study of economic entomology might be taught in country schools, this address is given before the Entomological Society of Ontario. The subject of entomology is one well fitted for study in rural schools; specimens are readily obtained for illustration, and, it is especially suited to interest young minds.

This can be accomplished without additional expense in purchasing books, and with little withdrawal of time from the time-table.

The writer would suggest a series of talks upon the subject the last hour on Friday afternoon, during a portion of the summer months, when insects are most numerous.

Especial attention should be directed to such insects as are beneficial, or injurious, invariably having the pupils collect specimens and contribute them so as to form a collection that would represent the economic entomology of the section.

The following might be taken as an outline of several talks, before specific forms of insects were discussed, and with a little study on the part of any teacher, would supply valuable information:

I. *Definition of an Insect—Nature of the Mouth—Life History.*

An insect, Fig. 21, may be described as having three well-marked divisions: head, thorax, and abdomen; one pair of antennæ (feelers), three pairs of legs, usually two

pairs of wings; respiration by means of tube-like structures (*tracheæ*), simple and compound eyes and jointed limbs. Most insects undergo metamorphosis—that is, pass through a series of well-marked changes in their development from the egg to the adult condition.

Among insects we find two typical mouths: the masticatory or biting, characteristic of beetles and the larvæ of many insects; and the suctorial or sucking, represented in butterflies and plant-lice. A knowledge of these facts becomes of importance in the application of insecticides. Insects with *masticatory* mouths can be readily poisoned by applying some poison, such as Paris green, to their food; but those possessing a *suctorial* mouth must be treated with a substance that kills by contact and not by being introduced into the digestive system. Such insecticides as *Kerosene Emulsion* and *Pyrethrum* powder are suitable for this mode of treatment. Thus, by knowing the nature of mouths, we are able to suggest what substance is likely to be effective in destroying insects.

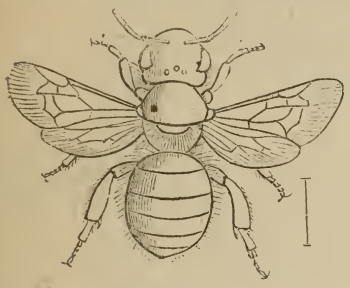

Fig. 21.

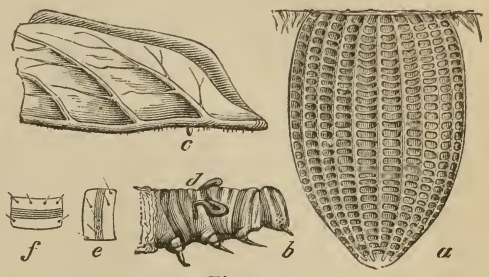

Fig. 22.

The development of an insect is represented by four stages—*egg*, *larva*, *pupa*, *imago*

The following figures illustrate the different stages of the Archippus butterfly, a red and black species which is familiar to every one. Fig. 22, *a* represents an egg, highly magnified, and *c* the egg of the natural size on the underside of a milkweed leaf; *b* shews the head and anterior segments of the caterpillar before its last moult, at *d* are the long fleshy horns, which at this stage are tucked under the skin; *e* and *f* shew the arrangement of the bristles on the segments.

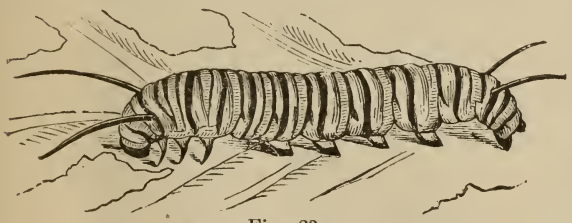

Fig. 23.

Fig. 23 represents the caterpillar which is handsomely marked with black, yellow and white transverse stripes.

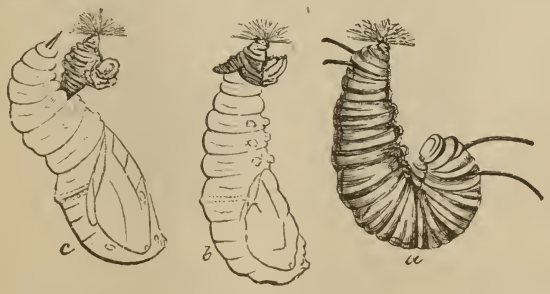

Fig. 24.

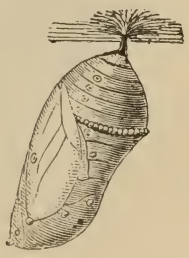

Fig. 25.

Fig. 24, shews the caterpillar at *a* suspended from a little button of silk preparatory to changing into a chrysalis; at *b* and *c* it is making further developments, till it becomes a lovely green pupa decorated with a band of golden spots, Fig. 25.

From this emerges in course of time the splendid butterfly, Fig. 26, which soars so gracefully through the summer air.

Fig. 26.

The *larva* (*larva*, a mask) is frequently without external organs and has a biting mouth; hence, it is a great feeder and usually very destructive to vegetation. The larval condition continues from two to six weeks in most; but there are some in which it is more than a year, *e.g.*, the wire worm, white grub, and some "borers."

Pupa (*pupa*, a doll). This is generally a resting condition, which, in summer, usually lasts but a short time (about two weeks); but if entered in autumn, continues till the next spring. The term *chrysalis* (*chrysos*, gold) is often applied to this stage in butterflies, because in some it is dotted with golden spots. In most moths a *cocoon* is woven around the pupa. Nymph is applied to the young of such as do not undergo complete metamorphosis in development; in such the young are much the same in appearance as the adult, but smaller, and usually wingless; *e.g.*, grasshoppers, bugs, etc.

Imago (*imago*, an image). This term is applied to the perfect insect, which is often harmless, as far as feeding upon vegetation is concerned.

The following names show some of the common terms applied to these stages in some orders of insects:

Larva	Pupa	Imago.
Borer, grub	"	Beetle.
Maggot	"	Fly.
Caterpillar or worm	Cocoon	Moth.
" "	Chrysalis	Butterfly.
Nymph	Nymph	Grasshopper.

Fig. 27.

Fig. 28.

II.—Insects may be Beneficial or Injurious.

Beneficial.—The bee (honey); silkworm (silk); cochineal (dye); ichneumon (feeds on injurious insects).

Injurious.—Those affecting the products of the field (midges, Fig. 27, the wheat midge, etc.); the garden (cut-worms, Fig. 28, etc.); the orchard (borers, Fig. 29, etc.)

School exhibit of the life-history of the army worm (see page 28).

A CASE ILLUSTRATING THE LIFE HISTORY OF THE ARMY WORM.

A CASE ILLUSTRATING THE LIFE HISTORY OF THE TUSSOCK MOTH.

III.—Remedies.

1. *Natural enemies.* *a. Birds.* Many investigations have been carried on to learn what insectivorous birds are useful in assisting man to keep in check his insect foes.

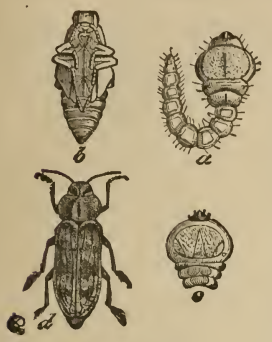

Fig. 29.

Thousands of birds have been shot, and the contents of their stomachs examined so as to ascertain with accuracy if the insects eaten were injurious. In some cases as many beneficial insects were devoured as harmful. The result of careful examination into the subject has been to consider the birds named in the following list as benefactors to the farmer, the fruit grower, and the gardener, and should, as far as possible, be protected and permitted to increase in number :—

King bird, pewee, night-hawk, swallow, whip poor-will, American redstart, yellow-billed cuckoo, blue bird, white-bellied nuthatch, red-headed woodpecker, high-holder, hairy woodpecker, downy woodpecker, golden warbler, red eyed greenlet, yellow-throated greenlet, Wilson's thrush, brown thrush, cat bird, red-winged blackbird, crow blackbird, oriole, meadow lark, indigo bird, song sparrow, grass finch, chipping sparrow, chewink, purple finch, snow-bird, American goldfinch, horned lark, wren, chickadee, golden-crowned kinglet ruby-crowned kinglet, and American creeper.

(*b*) *Mammals.* Moles, bats, shrews, racoons and skunks. (See Mr. Elliott's paper on Insectivorous Mammals.)

(*c*) *Insects.* Among the most beneficial insects we find the following in the different orders :


Fig. 30.


Fig. 31.


Fig. 32.

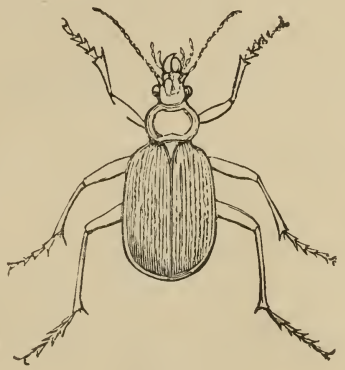
Fig. 33.


Fig. 34.

Order Diptera.—Syrphus fly (Figs. 30 and 31) ; Tachina fly.

O. Coleoptera.—Cicindela (tiger beetles) (Fig. 32) ; Calosoma (Fig. 33) ; Harpalus (Fig. 34) (ground beetles) ; Coccinella (lady-birds) (Figs. 35 and 36).


Fig. 35.


Fig. 36.


Fig. 37.


Fig. 38.

O. Hemiptera —Reduvius, Arma (soldier bugs) (Fig. 37).

O. Neuroptera.—Chrysopa (laced-winged flies) (Fig. 38).

O. Hymenoptera.—Vespa (wasps) (Fig. 39); Chrysis (cuckoo flies), Ichneumons, (Fig. 40).

Fig. 39.

Fig. 40.

The above insects are of great importance in keeping the injurious insects upon which they prey in check. The ichneumons are most valuable in this respect. They are very numerous, and prey on many injurious insects, by depositing eggs in the larval forms. These eggs give rise to larval ichneumons that feed upon their host, which finally dies. About this time the ichneumons are developed and escape as perfect insects. The lady-birds are destroyers of plant lice; ground beetles prey on the potato beetle and several caterpillars, and the tiger beetles are great devourers of several species of insects.

(*d*) *Plants.* Some plants in the lowest orders do good service in destroying insects by being parasitic. Some (Empusa) attack the flies in autumn; some (Sporotrichum) the dreaded chinch bug, which is sometimes a serious pest in various parts of the United States; while the white grub has among its destroyers the parasitic fungus Cordyceps.

2. *Insecticides (substances used for killing insects), Gas, Paris Green and Kerosene Emulsion.*

Poisonous gas, generated in tents placed over shrubs and trees affected by scale insects, etc.

Carbon Bisulphide.—This colourless liquid is a most effectual remedy to get rid of insects in granaries, but great care requires to be taken as it is very inflammable and explosive, and may lead to serious results if any fire is brought near; even a cigar or pipe used where the vapor is being evolved may prove disastrous. It readily volatilizes; the vapor is heavier than air and is deadly to insect life. In using it the liquid may be placed in a small shallow vessel and put on the top of the grain, in bins or barrels. These are covered so as to keep in the vapor, which sinks down through the grain, destroying insect life wherever it comes in contact with it. After the operation is over the grain will lose all odor in a short time if exposed to the air. Some prefer taking a wad of cotton or tow, saturating it with the liquid, then plunging it into the middle of the bin and leaving it. Two or three bunches thus placed among the grain will soon kill all such pests as are found in it. One ounce is about sufficient for two bushels of grain.

Paris Green.—(Arsenite of copper, containing 50-60 per cent. of arsenic.) This is applied dry or in solution. In the dry form it should be mixed with 50 to 100 parts of plaster, wood ashes, flour or air-slacked lime and dusted upon the affected plants. The form in solution is usually one pound of Paris green to 200 gallons of water; but if the foilage is tender, 250 to 300 gallons of water may be used. This is the usual strength applied upon the plum and peach. As the green powder does not dissolve it requires to be kept thoroughly mixed by constant stirring. One pound of lime to every 100 gallons will prevent injury to the foliage. The Paris green should be first made into a thin paste, in a small quantity of water, and then added to the full amount of water.

Kerosene Emulsion.—This is a mixture of coal oil and water.

Riley-Hubbard Emulsion.—Consists of half-a-pound of hard soap in one gallon of water. Boil till dissolved, and then add two gallons of coal oil, and mix thoroughly for about five minutes. When properly mixed it will adhere to glass without oiliness. This can be done by forcing it through the nozzle of a force-pump repeatedly until the mixture appears complete. It will then form a creamy mass which thickens into a jelly-like substance on cooling. In using dilute with nine parts of soft water. This form is very commonly used and is easily prepared. If the foliage is very tender the emulsion must be more dilute, fifteen to twenty parts water.

Whale oil soap is better than the common hard soap, especially if the emulsion is to be kept for some time. Soft soap may be used instead of hard, using one quart. Where the water is very *hard* sour milk may be taken; in that case you require only to mix the coal oil (two gallons) and milk (one gallon) to get the emulsion, the soap not being required. This emulsion is liable to spoil if kept long. Kerosene emulsion is a most successful remedy for plant lice and scale insects.

3. *Barriers.*

Using barriers to check the progress of injurious forms, such as chinch bug, army worm, etc.

4. *Traps, Baits.*

Entrapping the insects, such as codling moth, canker worm and cut worms.

(a) Trap the larvæ crawling up and down the trunk by bands of rough cloth or tow, under which they will crawl and spin their cocoons.

(b) Use means to trap the climbing females. This may be done by putting a band of some material smeared with tar around the tree, or using what are known as "tree protectors," a sort of funnel-shaped structure that is fastened around the tree three or four feet from the ground; these prevent the females from getting up the tree.

(c) In gardens poisoned baits may be successfully used, such as small bunches of clover, cabbage leaves, etc., dipped in Paris green solution (one pound Paris green to one hundred gallons water), and placed near the attacked plants. The cut worms will feed upon these and be destroyed.

5. *Agricultural.*

1. A proper rotation, so as to avoid sowing crops in fields where they are likely to be destroyed by insects.

2. Using good seed, *e.g.*, peas without bugs.

3. Varying the seeding time so as to have the plants either too late or too early to be attacked by injurious insects.

4. Summer fallowing, so as to starve the insects and expose them to birds, etc.

5. Drainage. Some insects prefer moist soil, in such cases drainage will render it unfit for them.

6. Fall plowing is injurious to many insects especially the wire worm.

7. Manure. The use of manure helps the plants and enables them to overcome insect attacks. Vigorous plants are more likely to escape than sickly ones.

If such an outline were followed, a portion being taken for each talk, the leading principles of economic entomology would soon become familiar. Then, particular insects might be studied, and the pupils be encouraged to work out the life history of some. Starting with the egg, and observing the different stages passed until the perfect insect is reached.

Would it not be an excellent plan to influence the directors of county fairs to offer prizes for the best collections of beneficial and injurious insects, or for the best case illustrating the development of an insect from the egg to the imago?

If our teachers, in rural schools, were to follow a course something like what has been outlined in this address, who could estimate the influence upon the rising generation of farmers? Teachers desirous to take up this work could readily secure bulletins and books that would serve their purpose admirably. The writer would not have pupils get books, but to depend entirely upon the instructions of the teacher and their own observations in the orchard and upon the farm.

Such study of the great Book of Nature would result in developing observation in young minds, something that is aided very little in our system of education among rural schools. No faculty in the young mind is so ready for development as observation, and yet how little is done to assist it. Nature furnishes material on every side in the country, and surely we should take advantage of it and early train our young to be close observers.

We have no doubt that the study of such subjects would increase the attractiveness of farm life, and serve to keep many a boy upon the farm who, with such surroundings as we find to-day, seeks the shadowy allurements of a home among overcrowded centres in town and city.

We hope the day is not far distant when the teachings of na ure will be better known in country sections, and that the boys and girls of our farming districts will see more in farm life than what some bemoan as drudgery; that they will see in it that which tends to health, peace, independence, and an ideal home; and that while they eagerly learn *how* a thing should be done, they will also know the reason *why*, so that practice and science, the handmaids of agriculture, will be more closely associated than in the past.

In the discussion which followed the reading of the paper, Dr. Bethune said that as he had been a school-master for six and twenty years he could well appreciate all that had been said, both by the President and Professor Panton, on the subject of teaching entomology in schools, especially in those situated in rural districts. Any one who tried it would be pleased and surprised to find how readily people in general are interested in subjects of this kind, even when they have not paid any attention to them before. And in the case of children, who are always curious about anything that attracts their attention, it is an easy matter to excite their interest and lead them to observe for themselves some of the wonders and beauties of Nature. He thought that the plan of devoting the last hour on Friday afternoons in country schools to talks upon Natural History was an admirable one, and he hoped that it would be widely adopted. He had formerly made use of this hour in a similar manner himself, but of late years the large increase in the number of subjects for the Matriculation Examination had rendered it impossible to spare the time. He thought that if country life could be made more interesting to the young people fewer of them would be so eager to abandon their farms and rush into the towns and cities.

Mr. John S. Pearce spoke of the valuable work of the Society, which he did not think was as generally known as it should be. He thought that more should be done, especially by paragraphs in the newspapers, to draw the attention of the public to the great benefits which the Society has been for years conferring upon farmers, fruit-growers and gardeners throughout the Dominion.

Mr. John Law moved a vote of thanks to Professor Panton for his excellent address to which he had listened with great pleasure. This was seconded by Dr. Woolverton, and carried unanimously. In putting it to the meeting the President (Mr. Dearness) spoke on the importance of training the powers of observation of children by bringing subjects of nature before them. The object would then become the teacher, and the school-teacher the interpreter.

The Rev. T. W. Fyles then read the following paper :

THE IMPORTANCE OF ENTOMOLOGICAL STUDIES TO AN AGRICULTURAL AND FRUIT-GROWING COMMUNITY.

Rev. Thomas W. Fyles, F.L.S., South Quebec.

It is wonderful proof of the wisdom and goodness of God that this earth, which He hath given to the children of men,* is so fitted and prepared that it affords scope and claim for the exercise of man's powers, and that man himself is so constituted that the employment of those powers is conducive to his well-being and enjoyment of life.

So true is this that though the fiat has gone forth—"Thorns and thistles shall the earth bring forth to thee. In the sweat of thy face shalt thou eat bread," it is also written, "Thou shalt eat the labour of thine hands. O well is thee, and happy shalt thou be."

In the vegetable kingdom materials in such great variety are so abundantly furnished, and man finds that he can, to so great an extent, select, transplant, modify and improve the plants producing them, for the supply of his necessities and gratification of his tastes, that he is stimulated to exertion, and comes to realize that he is, in a humble way, a co-worker with God ; and his work is ennobled to him by the thought.

And not only do men, whose very living depends upon their endeavours in the field, the garden, the orchard and the vine-yard, take an interest in rural occupations and their rewards ; "The king himself"—says the wise man—"is served by the field" ; and the devotes of Ceres, Flora and Pomona are to be found as well among the highly gifted and trained leaders of the public as among the hard-handed sons of toil. The most eminent statesman can take pleasure in a *primrose* or an *orchid.* The great Lord Bacon spoke of Horticulture as the "purest of human pleasures ; and the "Judicious Hooker," one of England's most learned and thoughtful divines, desired no higher preferment than a country cure, in which he might see God's gifts spring fro n the bosom of the mother earth.

It is the general interest in the productions of the soil, and whatever affects those productions, that is the *raison d' être* of the scientific associations fostered by our Department of Agriculture.

The task I have set myself is to shew the importance of Entomological studies to those who take an interest in the cultivation of the soil.

Entomology has to deal with "the locust, the caterpillar, and the palmer-worm"—God's "great army." So vast is this army that—to use the words of Dr. Lintner, the State Entomologist of New York—"it has been truthfully said that insects have established a kind of universal empire over the earth and its inhabitants. Minute as many of them are, and insignificant in size to other than naturalists, yet in combination they have desolated countries and brought famine and pestilence in their train." (First Report, p. 2.) Happily the hordes are duly apportioned. Each natural division of territory has its share. And there is such a marvellous arrangement of checks and counter-checks operating upon them that, as a rule, every kind is held in proper subjection.

The intentional or accidental transportation of an injurious species beyond the sphere of the operations of its natural foes sometimes occasions disaster.

Of the injuries wrought by imported insects we have had instances never to be forgotten, in the ravages of the Hessian Fly (*Cecidomyia destructor*, Say), the Cabbage Butterfly (*Pieris rapæ*, Linn.), the Colorado Potato Beetle (*Doryphora decem-lineata*, Say), the Larch Saw fly (*Nematus Erichsonii*, Hartig), the Gypsy Moth (*Ocneria dispar*, Linn.), and the Fluted Scale (*Iceryia Purchasi*, Maskell).

It must not, however, be supposed that all insects are injurious. Many species must be ranked among the cultivator's friends. Indeed, of the 25,000 named species of North American insects about 8,000 only can be regarded as pests.

* Ps. cxv, 16.

Some species are injurious in one stage of their existence and useful at another.

Our Hawk-Moths by dispersing pollen act beneficially for the fertilization of blossoms; but if unchecked increase were allowed them, their caterpillars would become terrible pests, and would destroy not only our fruit-trees but many of our shade and ornamental trees also. Their numbers are however kept down by various species of ichneumons belonging to the genera Ophion, Cryptus, Microgaster, Apanteles, etc. I have seen as many as 150 parasitic grubs issue from one larva of *Sphinx Kalmiæ*, A. & S. It can easily be conceived that foes so numerous and so deadly would soon exterminate the Sphinges altogether.*

This would be a pity for, as I have said, the moths of the family perform a useful part. They are moreover very beautiful, and

"A thing of beauty is a joy forever."—*Keats.*

But the checks are met by counter-checks. Of those 150 grubs that I have mentioned not more than two or three escaped the attacks of a secondary parasite, *Pteromalus tabacum*, Fitch. This last named insect is a brilliant little object that once seen can hardly be forgotten.

People are familiar with the idea of one grub feeding inside another grub; but it is not so generally known that there are insects that pass their early stages and attain perfection inside the eggs of other insects. Ashmead in his valuable work on the Proctotrypidæ, published in 1893 by the Smithsonian Institution, has given descriptions of forty-one such insects.

Then there are numerous kinds of ground-beetles, lady-birds, syrphus-flies, soldier-flies, dragon-flies, etc., predaceous on other sorts, and therefore beneficial to man.

The first point I make then is this:—*A knowledge of Entomology is important that men may rightly distinguish between their insect friends and their insect foes.*

In a paper which I had the honour to read before the Fruit Growers' Convention at Ottawa, I showed the important work done by Humble Bees in the cross fertilization of blossoms. These insects are so entirely beneficial that some of their kind have been—with a sort of grim propriety—transported to New Zealand to labour there for the public good.

But, at the very time that the Humble Bees are operating in the orchard for the fruit grower's benefit, there are a number of other insects at work that do a vast amount of harm, namely; the Bud-worms, Canker-worms, Leaf-rollers, etc. *The great remedy against all these hurtful insects is arsenical spraying.* But if this spraying be delayed till the blossoms are opened the nectaries will become clogged with the arsenite, and though the instinct of the bees may lead them to shun the poisoned blossoms, the good those insects would do will be left undone. *The first spraying should be given before the flower-buds are opened; the second after the fruit is fairly set.*

The Ontario Legislature passed a law in April, 1890, which says:

"Sec. 1. No person in spraying or sprinkling fruit trees during the period within which such trees are in full bloom shall use, or cause to be used, any mixture containing Paris green, or any other poisonous substance injurious to bees."

Promptitude in dealing with in urious insects is always of the utmost importance.

A patch of aphides neglected will spread, and spread, till it covers a tree—a little one becoming a thousand.

The apple tree Aphis (*Aphis mali*, Fab.) lays its eggs in the fall; and Mr. F. M. Webster suggests that apple trees should be sprayed in winter (see 24th Rep. of the Ent.

* Let us suppose that the whole number of grubs mentioned would produce perfect insects, and that half of these would be females; then let us see what the natural and unchecked increase of these would be at the end of five years. A little figuring will shew that it would amount to the enormous number of 4,746,093,750.

Soc. of Ont., p. 90) for the destruction of the eggs. We should have to take an unusually mild time for such a purpose in this country! I dare say, however, that a spraying early in November, or early in the spring would be beneficial. Kerosene emulsion, made by violently agitating a mixture of two gallons of kerosene and one gallon of hot soap solution is prescribed as the remedy for use. It should be diluted with nine gallons of water (Lintner's 5th Rep., p. 161).

Late in the fall, or on favourable days in winter, the fruit grower can do good work by examining his trees and removing the egg masses of various species of injurious insects. A trained eye can readily detect the eggs of *Clisiocampa Americana*, Harris, Fig. 41. *Orgyia nova*, Fitch, *O. leucostigma*, A. & S., and the cocoons of *Platysamia Cecropia*, Linn., *Telea Polyphemus*, Linn., *Callosamia Promethea*, Drury, Fig. 42. etc. But in removing such as these he should be careful not to destroy the clustered cocoons of microgasters, nor the downy masses of those of *Apanteles longicornis*, Prov.—a species that is parasitic in the Tent caterpillars—for these insects are among his most valuable friends.

Fig. 41.

The destruction of every hibernated Potato Beetle in the early spring is the destruction of an incipient host. The potato plants should be sprinkled with Paris green as soon as they appear above ground.

A friend of mine when the beetles first invaded the province, and before it was quite known how they should be dealt with, broke up a piece of land in the very centre of his extensive farm, and planted it with potatoes, hoping that its isolation would secure him a good crop. One early day he went to the enclosure to see if the potato plants were shewing themselves. They were not; but to his disgust there was, to use his own words, "a durned potato-bug sitting on the fence, and awaiting for them to appear." His action in regard to that individual was both prompt and effective!

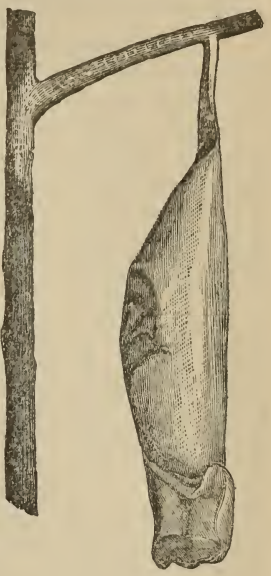

Fig. 42.

Gooseberry and currant bushes should be gone over with white hellebore *as soon as the leaf-buds begin to open.*

The eggs of many of our hurtful species are laid in patches, as for instance those of *Datana ministra*, Drury, which produce the yellow-necked apple tree caterpillars, and those of *Œdemasia concinna*, A. & S., which produce the Red-humped apple tree caterpillars, Fig. 43. The young broods of these may be found in July, each brood feeding on the *under side* of a leaf. The plucking and destroying of a leaf and its burden is easily accomplished.

The Round headed Borer of the apple tree (*Saperda candida*, Fab.), Fig. 44, is a

Fig. 43.

Fig. 44.

troublesome pest. Its native food-plants are the thorn, the moosemissa and the shadbush, but it takes far too readily to the apple tree. The perfect beetle appears in June,

and lays its eggs in the end of that month and in July. In June then is the time for the fruit grower to go over the stems of his young apple trees with a brush and diluted soft soap. He can give them a scrubbing at the same time if he likes. Sir Joseph Banks freed his apple trees from the American Blight (*Erisoma lanigera*, Hans,) by the use of the scrubbing brush alone (Kirby and Spence's Entomology, Letter VI.). The second point I make is:—THE STUDY OF ENTOMOLOGY IS NECESSARY THAT THE CULTIVATOR MAY KNOW HOW AND WHEN TO DEAL WITH HIS INSECT FOES.

The study of Entomology is profitable. What harm and loss have been averted by the making known of insecticides and how to use them! *But greater good is sometimes done by calling in the aid of friends than by direct attacks upon foes.*

The introduction of the Australian Lady-bird (*Vedalia cardinalis*, Mulsant) has probably saved the orange groves of California from extinction.

I have no doubt that if the parasite (*Diplosis grassator*, Fyles) which keeps down the numbers of the Philloxera in this country had been carried over to Europe it would have saved many a vine-yard that has disappeared.

The late Professor Riley introduced from Europe the species *Microgaster glomeratus*, which is a check upon the cabbage worm (*Pieris rapæ*, Linn.). The insect is figured and described in Wood's "Insects at Home," pp. 325-7. Wood tells us that "so rapidly does it multiply that after watching its progress from the larva to maturity, it seems strange that a single cabbage white butterfly should be found in the country." * * * "If a hundred cabbage caterpillars be captured, there will be only one or two which do not contain the larvæ of the microgaster."

Mr. A. D. Hopkins, of the West Virginia Agricultural Experiment Station, has lately introduced the European predaceous beetle, *Clerus formicarius*, Linn, to the United States; and it is thought that this insect will check the destruction of the spruce forests which has proceeded to such an alarming extent in that country. The clerid larva is the natural foe of the bark-boring and wood-boring larvæ. It searches them out and devours them with avidity.

As *Clerus formicarius* is a new importation to this continent, and is at present little known, a short description of it may be acceptable. The beetle is about three-eighths of an inch in length. Its head and the fore part of its thorax are black. The after part of the thorax and the base of the wing-covers are brick red. The remaining portions of the wing-covers are black crossed by two somewhat wavy, snow white lines.

The name Kleros was given by Aristotle to certain larvæ found in bee-hives. The trivial name *formicarius* was given to this species by Linnæus because of the ant-like form of the beetle. (See Wood's "Insects at Home," p. 138).

A knowledge of Entomology was necessary for the understanding of the habits of these predaceous and parasitic insects, and for placing them where they might work to man's advantage. And this bringing about of good by the direction of natural agents is only in its inception. As our knowledge increases we shall, in all probability, be able to direct and control forces that are at present but little understood. My third point is:—THE STUDY OF ENTOMOLOGY IS NECESSARY THAT THE AGRICULTURIST AND FRUIT GROWER MAY MAKE THE MOST OF THEIR INSECT FRIENDS.

The Americans—a practical people—are fully alive to the importance of entomological research. Their division of entomology in the Department of Agriculture; their national museum; their experimental stations dotted all over the Union: their numerous scientific commissions, with their reports and bulletins—all bear witness to this fact.

Our own authorities do not mean to be behind hand. The establishment of experimental farms, the encouragement given to scientific and economic societies, farmers' clubs and institutes, etc., the printing and distributing of reports upon practical subjects, betoken an enlightened policy on their part.

But notwithstanding all that has been accomplished, sufficient care has not, I think, been taken to reach the young.

In 1887, in a paper read before the Teachers' Convention at Sherbrooke, I advocated the cultivation in schools of a taste for natural history. The means I recommended to teachers were :

I. Conversations on natural objects ; informal lessons ; extempore sermons on texts from the book of nature.

II. The formation of school museums, libraries and gardens.

III. The giving of formal object lessons, each complete in itself, and bearing upon the purpose in view.

Examples of peripatetic lessons on natural history may be found in Gosse's "Canadian Naturalist" (which is now, I am sorry to say, out of print) and in "Country Walks of a Naturalist with his Children," Groombridge & Sons, London.

Hints for the formation of school museums may be found in a work written by a brother of a former rector of Quebec, and published by the S. P. C. K., viz.,— "The Story of our Museum," by the Rev. Henry Houseman, A.K.C.

We need some one to do for Canada what Miss Ormerod is doing for England to popularize Practical Entomology.

We need a hand-book on this subject, written after the model of that useful work "Spotton's High School Botany," for use in our public schools.

We need school wall-sheets, representing the most important of our insect friends and insect foes in their different stages, and giving a few brief particulars concerning them.

But it is time I brought this paper to a close. I will only say in conclusion that I know of no study more fascinating than that of entomology. It deals with objects of such exceeding beauty ; the life histories it makes known are so marvellous that they tell like fairy tales ; and, above all, the revelations that it makes to us of the Divine power, wisdom and goodness so lift our thoughts from earth to heaven that we are ready to exclaim with the Psalmist, "Oh Lord, how manifold are Thy works, in wisdom hast Thou made them all ; the earth is full of Thy riches." Ps. civ. 24.

Mr. Wm. Lochead spoke very highly of Mr. Fyles's papers in the annual reports, which he always read with great interest and pleasure. He thought that the popularizing of the study of entomology in our schools would form another step in the progress and advancement of Canada. He then gave an account of the work that was carried on at Cornell University in connection with entomology and described the advantages to be gained from the lectures, and the practical work in the "Insectary," from such able teachers as Professor Comstock and Mr. Slingerland.

Mr. J. Law moved a vote of thanks to Mr. Fyles for his valuable paper, and was seconded by Mr. W. Scarrow, who spoke of the lack of mental interest in farmers, which might, he thought, be developed by education in entomology and the study of other natural objects, and in this way farm-work would become a pleasure instead of mere drudgery.

A very humorous paper was then read by Mr. Law, in which he gave amusing descriptions of the experience he had with ants and other insect pests during a residence in Cuba ; he related an attack which he witnessed of a large spider on a humming-bird, and spoke of the size and beauty of the fire-flies and the profusion and variety of insect life in the tropics.

The meeting adjourned at 10.30 p.m.

THURSDAY, October 22nd.

MORNING SESSION.

The society met at 9.30 o'clock, the President occupying the chair, and proceeded with the reception of the reports of the several sections of the society and other matters of a business character.

The following report of the Geological Section was read by its secretary, Mr. John Law :—

REPORT OF THE GEOLOGICAL SECTION OF THE ENTOMOLOGICAL SOCIETY FOR THE YEAR 1895-6.

The members of this section beg to submit the following report for the past year :

Regular meetings were held weekly during the year, with a fair attendance. There has been no great increase of membership, but we look forward to our future place of meeting in the new building of the Y. M. C. A. as a means of stirring up our members to increased action in matters relating to the mineral wealth of our country and the welfare of the local section.

Additions have been made from time to time to our individual collections obtained from trips to outside places during the season. Our hopes for forming a central collection have not yet materialized owing to the failure of the effort to obtain the only rooms suitable for that purpose in the new public library building. This Section is pleased to state, however, that a collection of minerals has been presented to the free library, through the influence of Sir John Carling, by the Dominion Government. It is now accessible to our members, having been recently arranged and classified by the chairman of the section ; this is putting into effect what was suggested in our last year's report, viz., "That it would be a great advantage to students of mineralogy if some steps could be taken by which the small number of geological and natural history societies in the Province could be provided with suitable collections of accurately named specimens of the chief economic minerals of the Dominion." A collection of minerals at the Western University is also available.

A number of places of geological interest have been visited by one or more of our members during the past season. A stroll through the Niagara district from Grimbsy to Hamilton afforded a collection of fossils from the prevailing rocks in that vicinity, viz., Niagara, Clinton, Medina, the upper Silurian formation. Other places visited were Owen Sound, Kettle and Stony Points (Lake Huron), Forest, St. Thomas, Sault Ste. Marie, Petosky, St. Ignace and Mackinac Island (Michigan), and Bruce Mines on the north channel.

Collections were made from each of these locations, affording the section plenty of new material for the coming winter's work. Valuable papers have been read from time to time before the section on natural history, astronomy and physiology. Some four to five lectures were also given on psychological subjects by the Rev. Mr. Falling.

A number of second year students of the Western University are also taking up the study of geology and mineralogy with the section.

Signed on behalf of the Geological Section by

S. WOOLVERTON, Chairman.

JOHN LAW, Secretary.

REPORT OF THE BOTANICAL SECTION OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

In presenting their annual report the Botanical Section have pleasure in stating that the work of the year has been on the whole satisfactory and encouraging.

The meetings have been well attended, interesting and profitable, the new members especially showing an unusual interest in the work.

Meetings were held regularly every Saturday from the 1st May till the middle of July, after that the absence of many members on holiday trips and other uncontrollable circumstances interfered much with our meetings.

The work of the section was arranged so that the more advanced was taken one Saturday, and instruction classes in the more elementary work the next Saturday, the senior members taking turns in directing the examination of types of the common orders collected by the members.

The outings this year were mainly to localities near the city—one exception being a very pleasant trip to Woodstock and neighborhood, where the section were very hospitably entertained by Mr. Thos. P. Hart of that district.

Rare specimens obtained were *Orchis rotundifolia* and *Ophioglossum vulgatum*.

It is believed that the removal to more commodious rooms in the new Y. M. C. A. building will place the section as well as the society and their objects more prominently before the citizens, and result in a greatly increased membership, and consequently usefulness of both.

The section, while congratulating its ex-secretary, Mr. W. T. McClement, M.A., on his appointment to an important position in the Armour Institute, Chicago, regrets his removal from London. When he left he had tabulated the flora of London and environs as far as the Compositæ. This important work will be carried on by the section during the coming season.

A. HOTSON, M.D., Secretary.

REPORT OF THE MICROSCOPICAL SECTION OF THE ENTOMOLOGICAL SOCIETY.

Under the leadership of Mr. Rennie, the Microscopical section has had a year of continued success. The interest of members has kept them diligent in the good work. Notwithstanding the drawbacks consequent upon the poor position of our meeting place, the attendance has been well sustained. We think that in no year have we had more interesting subjects and never have they been presented with greater ability.

Meetings began on October, 11th, and were held each alternate week till April, 17th, when this section closed its meetings in favor of the Botanical, these two sections covering the year between them. We had but one meeting open to the public. This was well attended and general satisfaction was expressed at the many wonderful and beautiful objects under the microscopes.

The subjects studied during the year were as follows:

Desmids.—Their history, structure, distribution and classification, with drawings. These were illustrated by a large variety of specimens. Led by the Secretary.

Crystallography.—Specially as it applies to minerals, with specimens viewed both with and without polarized light. Led by Dr. Wolverton.

The Perisporiaceae.—Practical classification by members. Led by the Secretary.

Chemical Staining of Vegetable Tissues. Led by Dr. Hotson.

Mosses.—Their history and dissection. Alternation of Generations, etc. Led by W. T. McClement, M.A.

Bacteriology. Led by Dr. Neu.

Photo-micrography. Led by Mr. Rennie, who had apparatus present and produced a very fine photo-micrograph of a small insect.

Seeds and their microscopical appearance. Led by Mr. Balkwill.

The relations between Gymnosperms, Cryptogams and Angiosperms. Led by Prof. Dearness.

Animal Hairs.—The significance of their structure, accompanied by a large number of mounts. Led by Prof. W. E. Saunders.

This section has suffered during the year by the loss of two of its active members, Mr. J. M. Denton whose removal by death we all deeply mourn, and Mr. W. T. McClement, M.A., whose home is now in Chicago.

We look out upon another year with anticipations of greater usefulness than we yet have had. The new rooms which we are to occupy will give the Microscopists an opportunity, such as they never have had, of coming under the public eye. It is the intention of this Section to infuse renewed zeal into their work. The wonders the microscope reveals as well as its delights are almost unknown to the public, and it is our purpose to make our meetings more popular during the fall and winter months.

JAS. H. BOWMAN,
Secretary.

The following paper was then read by Professor Panton, who prefaced his remarks by suggesting that a paper should be written by some one connected with the Society setting forth the advantages of the study of Economic Entomology. He spoke also of the necessity of making the work of the Society better known throughout the country and advised the publication of an abstract of the Annual Report in the daily papers. He also recommended that the conductors of county exhibitions should be urged to offer prizes for the best life-history of injurious insects, with specimens illustrating its various stages and modes of operation.

TWO INSECT PESTS OF 1896.

By PROFESSOR J. HOYES PANTON.

During July of 1896, the attention of the public was, almost, daily directed to a newspaper item referring, either to the "Army Worm" or "Tussock Moth."

The former appeared in many parts of the Province or Ontario; and, in some places, destroyed considerable grain; the latter, was confined to the City of Toronto; where it did much damage to ornamental trees in different parts of the city. The writer having had the opportunity of visiting several of the infested districts, has thought it expedient to place before the Entomological Society of Ontario the results of his investigations.

THE ARMY WORM.

Leucania unipuncta.

We find the army worm reported as present in the township of Eldon, Victoria county, in August 1833, and, common in many places throughout Ontario Province in 1861.

In July, 1894, it did considerable damage in the counties of Lambton and Victoria.

MAP SHEWING

THE

DISTRIBUTION OF THE ARMY WORM

IN ONTARIO

1896.

The Black portions are the infected districts.

The first notice received at the Agricultural College of its appearance in the Province of Ontario this season, was, in a letter from Marshville, county of Welland, dated July 3rd. On that date, Mr. J. Reavley, living near Marshville, sent some of the worms and a letter describing the attack. The writer visited Mr. Reavley's farm on July 9th, and several others in the townships of Wainfleet, and Humberstone the next day. Throughout the month, letters were daily received, announcing its arrival at different places throughout the Province of Ontario. On the 8th of July, the caterpillars appeared in an oat-field at the Agricultural College, by the 11th, they were very numerous, and reached their maximum on the 15th. From that date a perceptible decrease was daily observed, so, that by the 18th, only a few remained. They began to pass into the pupa stage on the 14th, and, the first moth was observed on 29th of July. Circulars were then sent out, with a view to learn something of the distribution of the army worm at this time; the damage done by it; the means employed to check its progress; and the length of time the caterpillars continued. About 450 replies were received from different townships, throughout the Province.

The accompanying map shows the distribution of this insect pest in Ontario during 1896.

The counties reported as infested are as follows:

Essex (5); *Kent* (8); *Elgin* (6); Norfolk (3); *Haldimand* (4); *Welland* (4); Lincoln (1); Wentworth (1); Peel (1); York (3); Ontario (1); Durham (3); Northumberland (1); Hastings (1); Lennox (1); Frontenac (2); Leeds (4); Dundas (1); Russel (1); Carleton (1); Renfrew (2); Parry Sound (1); Muskoka (5); *Simcoe* (6); *Grey* (6); *Bruce* (5); *Huron* (5); *Lambton* (7); Middlesex (4); Oxford (5); Waterloo (2); *Wellington* (5); Perth (3); Cardwell (1); Dufferin (3); Victoria (1); Peterboro (2); Algoma (1); Manitoulin (2); 39 counties and 118 townships.

The counties written in italics are referred to by observers, as suffering considerable loss. The figures after each county indicate the number of townships reported as infested. In many places the damage was slight, as the worms were too late in arriving to do much harm, owing to the advanced condition of the crops attacked. Early sowing is evidently favorable to an escape from disastrous results by an invasion of this pest. Of the crops attacked, oats suffered most; they seem to be a very attractive food for this caterpillar.

From a count made of crops reported attacked, 58 per cent. were oats, 20 per cent. corn, 16 per cent. wheat, and 5 per cent barley. Some observers report a loss of 50 per cent. in oat-fields, while in most of the other cases the damage was comparatively slight. There were a few cases reported in which almost the whole crop was destroyed. In one oatfield at the college 50 per cent. of the crop was destroyed. In this case the worms were in all parts of the field before being discovered, and no measures could be adopted to stop their ravages. In most cases the attack did not continue longer than two weeks, in several, it lasted but a few days, and very seldom lasted longer than three weeks.

Several worms are known as the "army worm," but the true one is that which has appeared in so many parts of Ontario during the month of July, 1896. It seems also to have been common in several parts of the United States about the same time.

A despatch in one of our daily papers, dated, Washington, July 16th, reads: "Reports to the agricultural department indicate great ravages by the army worm, in all states from Maine to Wisconsin. The pests have been particularly destructive in New York, Massachusetts and Pennslyvania; there is no doubt that the losses will foot up into the millions." In New York State it appeared in 48 counties, and is reported, as the worst invasion in the history of the state. They were, also, common in Ohio and Illinois.

As grain crops were well advanced before its arrival, in many places of Ontario, the damage done was much less than it might have been. The attack, though in many

counties, was usually confined to small areas in each case, so that on the whole, the loss was not great.

The army worm (figures 45 and 46) is not at all a rare insect, and, from time to time, appears in Canada and the Northern States. We find it referred to as far back as

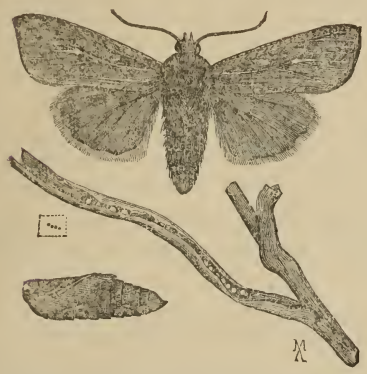

Fig. 45. Eggs, larva, pupa, imago of the army worm (*Leucania unipuncta*).

Fig. 46.

1743, 1861 is known as, "the army worm year," in the United States. During that year it received considerable attention and study. In 1869, it was quite common, also in 1872; 1875 was a bad year, and in 1880 it attracted much attention. The years 1861, 1875, 1880, are those in which the insect seems to have demanded most attention.

The moths are hatched from small, round white, *eggs* laid on wild, or cultivated grasses, and sometimes on grain along the inner base of the blades, where they are doubled, or, between the stalk and its surrounding sheath. The rankest tufts of grass seem to be preferred, but, in some cases, the eggs are found on pieces of cornstalk, and they have been found upon spring and winter grain.

In one of the worst attacked oat fields, at the College, there were many old cornstalks from last year's crop; these, likely, afforded a suitable place for eggs, and this explains the sudden appearance of the caterpillars in all parts of it. This field was the first attacked, and from it many of the catterpillars appeared to have come, in this they were not confined to the edges, as was usually the case in the other fields. The eggs appear to be laid in the evening, or early night. They are deposited in rows, 15 to 20 in a row, on the folded leaf, which serves to conceal them. One female may deposit from 500 to 700 eggs, and seldom takes longer than two or three nights to do so.

The eggs hatch in about a week after being laid. The young caterpillars, in the first stage, can drop by means of a thread, and move with a loop-like motion. At this time, they are of a light greenish color, and thus resemble the plants on which they feed, and escape the notice of their enemies. The *larva* passes through five moults, at intervals of three or four days until it reaches the sixth stage, and is fully developed in about four weeks. The caterpillar is about one and a half inches in length, of a dark gray color, with blackish stripes, and numerous white lines along the back. In many specimens examined by the writer, comparatively few were light colored, until about the close of the attack, and then, the light ones were much more common. Some claim that the dark color is due to exposure. The length of time before complete development of the larva is reached depends a great deal upon temperature, and may vary from 16 to 28 days.

The mid-summer brood usually takes a shorter time than that of the fall. During the day they avoid the rays of the sun by hiding under clods, pieces of boards, chips, etc., and about 5 p. m. they emerge to feed.

In making observations about noon with Mr. Reavley near Marshville, we were surprised that so few worms could be seen at that hour, in a field badly attacked.

But on turning over sods among the oats, we found them in great numbers. We counted over 30 occupying a space no larger than the hand, and, in some parts, more than 50 to the square foot.

In a small patch of late oats on the Reavley farm scarcely a blade was left. The worms abandoned the ripening oats near by, and congregated upon the patch of late oats, no doubt, because they were more succulent.

Every stalk had from one to five worms upon it, and many were eaten to within three inches of the ground. They feed chiefly during the night, and sometimes in cloudy weather. Where they are in great numbers, they make a peculiar sound, which can be heard distinctly, while they are feeding, and cutting off the stalks and heads of grain. Under ordinary conditions, they do not travel, but live much as many other species of the cut worm family do (Noctuidae) to which they belong feeding by night, and hiding by day. However when food becomes scarce, they then undertake to march for new feeding grounds.

They stop at no obstacle, death only will make them halt. A piggery at the college impeded their progress for some days. They never attempted to go around it, but in vain tried to scale its walls, and kept constantly dropping, yet always ready to try the ascent again.

From observations made, as to this rate of travel, while crossing the lane between two fields they were seen to move two feet a minute (40 yards per hour.)

With us they usually appeared active from 4 o'clock p. m., and after that continued to move in great numbers, in all directions, and not in a definite line of march. While feeding, they devoured the leaves and then nipped off the head, which falling to the ground was no longer touched. In attacking some bearded wheat they nibbled off the awns, and only partially fed upon the grain. Oats, timothy, wheat, rye, and barley are their favorite plants; they also feed readily on corn, if young and tender; but they seem to have no inclination for any plants not in the order *gramineae* unless forced by hunger. In a hay field, they will leave the clover and devour every plant of timothy. Several of our fields had excellent crops of young clover; these were left untouched, while the oats and wheat were continually fed upon. In bringing some caterpillars from Humberstone, pea plants were put in the box with them for food, but they were scarcely touched in two days.

The following are results reached during our observations regarding the plants upon which they feed, oats, barley, wheat, and corn they readily devoured.

Clover. This was eaten very sparingly and was left if wheat or oats were introduced into the boxes containing caterpillars. Clover was put in the boxes on Monday, by Tuesday night it was hardly touched, but they began to feed upon it on Wednesday. They ate it only when nothing more attractive was obtainable.

Lucerne. This seemed less attractive and was not touched until Thursday. Clover, beans and lucerne were put in the same box; all were avoided at first, but, as hunger increased, the beans were first eaten, then clover, and lucerne last. Beans in the box were not touched till Wednesday.

Peas. They were not touched for two days. In a field sown with oats and pease, the latter were not attacked, as long as the oats remained.

Turnips. These were left untouched for a day; as soon as a leaf of corn was put in the box, the turnips were at once deserted. A turnip field bordered one of the infested oat fields; the caterpillars in leaving the latter passed through the former without feeding upon a single plant.

Potatoes, were left untouched in the boxes.

Mangels adjoining one of the invaded fields escaped damage, though caterpillars were constantly passing over and among the plants. In the boxes they were slightly nibbled.

Beets remained untouched for three days.

Buckwheat was taken after a day's fast, when nothing else was presented; but as soon as corn was added they immediately left the buckwheat to feed upon it.

Carrots escaped for a day, but in two days were fairly well eaten. They would not touch carrots in the presence of grass or corn.

Cucumber vines were preferred to beans, and were almost as readily eaten as some corn leaves.

Celery was continually avoided, and the worms began to devour one another before they would feed upon it.

Maple leaves were avoided, but some apple were sparingly fed upon, after two day's fast.

Grape leaves were taken, when no other food was present.

Strawberry leaves remained untouched till the third day.

Currant leaves were avoided for three days and then eaten, but sparingly.

Canadian thistles remained untouched.

When no food was put in the boxes containing caterpillars, in 24 hours they began to devour one another. Frequently in boxes containing unattractive food, heads were found among the leaves, these no doubt belonged to bodies that had been devoured by the survivors.

From these experiments, it would seem that the food of the Army worm is largely restricted to the *graminæ*, and that they will not feed upon plants from the *leguminosæ* and some other orders unless pressed by hunger. Consequently, there is little fear of any other farm crop being attacked than oats, wheat, timothy, rye, barley and corn.

Having become fully developed caterpillars at the end of three or four weeks from the time of being hatched, they pass into the ground, just below the surface or under stones, clods, etc., and enter the *pupa* stage. In a field at the College many pupa cases were found in cracks in the soil.

This condition lasts two weeks, and then the perfect insect (*imago*) emerges from its pupa case.

The moth is fawn-colored, with a small white spot near the centre of each front wing. The wings when spread measure one and a half inches across.

It conceals itself during the day and begins to fly towards night. Many could be seen flying around the electric lights in Guelph about the second week in August. The female has a more pointed abdomen than the male and her antennæ are smoother, and less hairy, than those of the male.

The moths feeding on flowers are more likely to be found near low ground, and hence they appear to come from such places. There appear to be three generations represented in a season or two broods in a year; the first wintering as larvæ, the second forming the "Armies," and the third larvæ derived from these after the imago has been developed; the last wintering as larvæ. The army worm usually winters in the larval form, but sometimes as the moth.

In the vicinity of our fields at Guelph, where the caterpillars were so numerous, we have as yet (Oct. 18th) failed to find any of the second brood.

The following stages (taken from Riley's report 1882) in the life history of an Army worm gives a good idea of the length of time that elapses in passing from the *egg* to *imago*. *Eggs* laid May 4th, hatched May 11th, 1st moult May 17th, 2nd moult May 20th, 3rd moult May 23rd, 4th moult May 26th, 5th moult May 29th: *pupa* June 2nd, *imago* June 17th.

At the College the first caterpillars were observed on the 8th of July; on the 9th there was a preceptible increase, 12th a marked increase; 13th large numbers; 14th, 15th still very numerous; on the 16th a perceptible decrease; 17th the decrease quite marked; 18th, 19th comparatively few; 20th only a few stragglers could be seen, and, most of these, were light colored. Towards the close of the attack, a bacterial disease seemed to destroy some of them. It is a matter of surprise to many how these caterpillars appear and disappear so suddenly, but a little reflection upon their life history explains the mystery.

Hidden in the grass by day, and feeding at night, they escape observation. If one or more dry seasons come, they multiply rapidly. Large numbers winter in the larval condition, and during the following spring moths appear and lay many eggs, which hatch and give rise to innumerable caterpillars which from a scarcity of food are forced to "march" and thus become suddenly conspicuous. These develop, pass into the ground to enter the pupa stage, and thus disappear suddenly.

Dry weather seems favourable for their development. Consequently a dry season, followed by a mild winter, and a dry summer, as in 1895, and 1896, supplied conditions very suitable for increase of the army worm in many parts of Ontario.

Having referred to the distribution, and life history of this insect, and some of our investigations in connection with it, we may now direct attention to some of the means by which it is, and may be prevented from being a source of alarm.

Natural remedies. The army worm has many enemies; nearly all insectivorous birds relish it as a sweet morsel, and are ready to feed upon it the moment it becomes conspicuous. In Guelph, this season, the English sparrows congregated in great numbers, where the caterpillars were numerous, and fed voraciously upon them. In some parts of the United States the bobolink is called the army worm bird.

Fig. 47.
Tiger Beetle.

Fig. 48.
(*Calosoma calidum.*)
[After Riley]

Fig. 49.
Ground beetle (*Harpalus caliginosus*)
[After Riley.]

Fig. 50.
Nemoraea leucaniae.

The ground beetles, *Calosoma calidum*, fig 48, and *Harpalus caliginosus*, fig 49, especially the former, were very numerous in the infested fields. Tiger beetles (*Cincin-*

delidæ) fig 47, also prey upon them. But, probably, one of the greatest insect friends to assist in destroying the army worm is the red tailed tachina fly (*Nemorœa leucaniæ*) fig. 50. In the infested fields of Wainfleet near Marshville, the writer found many of the caterpillars, bearing the eggs of this insect upon them. In some cases, several eggs upon a caterpillar, and the flies themselves buzzing around. At the college we seldom saw more than a single egg upon a caterpillar and this was usually near the head, in a position not easily reached by the worm to tear it off. We succeeded in developing quite a number of the flies. Shortly after the egg is deposited it hatches, and the small white grub bores into the worm (host) and feeds upon it, developing at the expense of the host's life. At first, none of the minute white eggs of the fly could be seen, though many caterpillars were examined, but in a few days, some were observed which indicated that a benefactor had arrived. This beneficial insect resembles a large house fly, but has a red tip at the end of the body. The first one appeared in our breeding cages Aug. 4th; the first army worm moth July 29th. Some observers have seen the yellow-tailed tachina fly (*Tachina flavicauda*) preying upon the army worm.

While developing the caterpillars we succeeded in securing several specimens of *Ichneumon leucaniæ*, another parasite, and one of *Ophion purgatus*.

Altogether, investigators have found some twenty different species of insects that attack and assist greatly in destroying the army worm.

It will thus be seen that the moment these insects emerge from their hiding places in grass fields, they are pursued by a host of relentless foes in the form of birds, predaceous beetles and parasitic flies.

Artificial remedies. 1. As this insect breeds largely in rank grass, such as is seen bordering swamps, it is well, where practicable, to burn such in the fall or spring. Clean cultivation, and the keeping of fence corners, etc., clean, should be followed, as far as possible.

2. Where the worm has appeared its progress may be stopped by plowing a furrow with its perpendicular side next the field to be protected, or a ditch may be dug in the same position. Holes dug at intervals of ten to fifteen feet, in the furrow or ditch will be useful in catching the worms, failing to climb the sides, and wandering aimlessly along the furrow. The worms collected in the furrow or ditch may be destroyed as follows: (a) Plowing a furrow, so as to bury them; (b) Sprinkling coal oil upon them; (c) Scattering straw over them and firing it; (d) Dragging a heavy pole along the ditch.

3. Where Paris green may be safely used a strong mixture (one pound to seventy-five gallons water) sprayed upon the plants likely to be first attacked will be effective. Windrows of green oats sprinkled in this way in the line of march will destroy myriads as they feed upon their favorite food. At the College immense numbers were destroyed in this way in a short time. By actual count made by the writer July 18th, 2,560 dead worms lay on a single square foot beneath the windrows.

4. Sometimes, conditions are such, that great numbers may be crushed under a roller.

5. Windrows of straw sometimes afford a place of concealment for the worms, and may be fired so as to destroy many beneath them.

6. Some recommend spraying several times a day with kerosene emulsion, a strip of ground over which the insects are passing.

Frequent reference has been made in newspapers to the use of salt or lime as an effectual barrier to their progress. We experimented with both, and found that in each case the worms moved over and through the lime and salt, apparently without the least difficulty.

Tussock Moth.

Orgyia leucostigma.

The Tussock moth is another insect pest which has attracted considerable attention during July, 1896. Though not widespread in its attack, it has occupied considerable space in the newspapers.

Its ravages have been largely confined to the defoliation of shade trees in the city of Toronto, and hence, appearing at a place where important daily papers are published, it received much notice.

Although in Toronto this caterpillar confined itself largely to an attack upon the horse-chestnut trees, yet it feeds upon the foliage of other trees. It has been found doing much injury to the elm and apple, and also feeding upon the plum, pear, maple, oak, walnut, butternut, locust and spruce. Few, if any trees, are exempt from its attack. It made its appearance in Toronto about July 1st, and remained for about three weeks, during which time it defoliated many of the horse-chestnut trees on Jarvis street, College avenue and in some other parts of the city. The writer visited the city July 27th, and had an opportunity to investigate its ravages.

This insect is readily identified in all its stages—*egg, larva, pupa* and *imago.*

Fig. 51. Fig. 52. Fig. 53. Fig. 54.

Orgyia leucostigma. *a* Adult female on cocoon. *b* Young larva. *c* Female pupa. *d* Male pupa. *e* Adult male (after Riley).

The eggs appear in masses (400-700) covered with a froth-like substance, that dries and hardens upon them, and serves to protect them from injury by the weather (rain), predaceous insects, and even birds. This covering is very white, and thus renders the

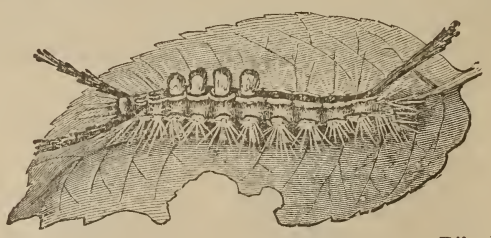

Fig. 55. *O. leucostigma,* full-grown larva (after Riley).

egg masses quite conspicuous at a considerable distance where they are deposited. These masses may be found on the trunk of the trees, in crevices of the bark, on the larger limbs, or in sheltered spots, such as fence boards and on bunches of dead leaves hanging upon the tree. In Toronto, the trunks of the horse-chestnut trees attacked presented in some cases quite a spotted appearance, from the innumerable white masses of eggs and cocoons attached to the bark.

As soon as the *eggs* hatch, tiny *caterpillars* (fig. 51, *b*) make their appearance (usually about June), and, as development proceeds, they pass through a series of molts, three—(one

a week). After the third, the larva (fig. 55) presents all the striking characters which make it so readily identified. The head, and the spots on the 9th and 10th segments are a bright red color; the back is black, with yellow lines along the sides; the body is sparsely covered with long, pale yellow hairs, giving the caterpillars a yellowish appearance. Four cream colored dense tufts of hair form a row upon the back of the 4th, 5th, 6th and 7th segments; while from each side of the head a long black tuft extends forward, and a single one projects backward from the posterior end of the body.

The young caterpillars soon after hatching scatter over the trees, feeding upon the leaves; when disturbed, they drop by a silken thread to the ground, wander about, many ascending the tree again.

Having reached full development, which takes about six weeks, during which they have reached a little over an inch in length, they enter the *pupa* stage (figs. 52 and 53), which lasts less than two weeks. The cocoon of the male is whitish, or yellowish, and very thin; while that of the female is much larger, of a gray color, and firmer texture. The male chrysalis is brownish, and shows rudimentary wings; the female is much larger, and shows no wing sheaths.

The cocoons may be found in crevices of the bark on the trunk, and large limbs, or in sheltered spots near where the caterpillars have been feeding. In Toronto the trunks of the trees were in some cases almost covered with them, and very many could be found beneath the window sills and the top boards of fences.

In about a week the *imago* appears. The male moth (fig. 54) is winged, and measures about 1¼ inches across the expanded wings; has feathery antennæ and very hairy front legs. The general color is ash-grey; the front wings are crossed by heavy bands of darker shade, with two black markings on the outer edge, near the tip, and a white spot on the inner edge, also near the tip. The writer succeeded in getting very few of the males, but numerous females.

The female (fig. 51) is wingless, of a pale gray color; short antennæ, not feathered. She is scarcely able to walk. Soon after emerging from the cocoon she begins to lay her eggs upon the old cocoon, and covers them with a frothy substance; as soon as this is done her life work ends, she drops exhausted and dies. The winter is usually spent in the egg stage, when clusters of them may be seen upon the trees.

Much depends on the season whether there will be one or two broods (a brood occupies about two months in completing its development).

Natural remedies.—Very few birds care to swallow this hairy caterpillar; the only ones that seem to feed upon it are the robin, Baltimore oriole, and the yellow-billed cuckoo. Some bugs (*Prionidus cristatus*) occasionally attack it. A large number of parasites follow in its trail, and do good work in checking its increase.

A great many ichneumons (*Pimpla inquisitor*) developed among the cocoons brought from Toronto for further examination.

Two Tachina flies also were developed in the cages. They resembled those of the army worm, but were smaller,

Artificial remedies.—1. Spraying with Paris green mixture (1 lb. in 150-200 gallons of water) will destroy the caterpillars feeding upon the leaves. If there is any danger of injuring the foliage, 1 lb. to 160 gallons of water, to which is added 1 lb. of quicklime, may be used.

2. Gather the eggs in winter, as they are very conspicuous at that time, and may be readily destroyed.

3. Bands of adhesive material may be painted around the trunk. These will prevent the caterpillars ascending the tree.

This caterpillar, though capable of doing much injury, is not considered to be a difficult one to control. Spraying as above is very effective, and this followed by collecting and destroying egg masses when the leaves have fallen, cannot fail to be successful.

In the case of the attack at Toronto, active measures were not adopted until the caterpillars had almost completed development, and were about to enter the pupa condition.

Energetic efforts were then put forth to destroy the innumerable cocoons that were soon visible. No doubt thousands of egg masses were destroyed upon the trunks of the trees, in the work of rubbing the bark with a coarse brush. At first a band of adhesive material was painted upon the trunks, and thus many caterpillars were prevented reascending the tree, but as soon as cocoons were discovered, this method was abandoned and that of destroying the cocoons followed. It will be well for those interested to be on the watch the coming season, and if caterpillars appear, at once resort to spraying. During the winter all egg masses should be destroyed as far as possible.

Dr. Bethune thought that the Society should be congratulated upon being favoured with so valuable a paper as that to which they had just listened. There could hardly have been presented a more complete life-history of these two species of injurious insects and he was sure that its publication in the Annual Report would prove most useful to a large number of readers. He then proceeded to give his experience of the army-worm this year. (See his paper, Notes on Insects of the year 1896, page 55). At the recent meeting of the American Association of Economic Entomologists held in Buffalo, N. Y., in August last, at which he and Dr. Fletcher had the honor of representing the Society, the army worm formed one of the most conspicuous features among the reports on the season given by many of the members present. Dr. Lintner, State Entomologist of New York, reported its occurrence in forty-eight out of the sixty counties in the state, and considered it the worst insect attack in his experience. Mr. Kirkland stated that it had been very abundant and destructive in Massachussetts, especially to cranberry plants; he estimated the damage done in that state alone at $250,000 at least. In New Jersey, Prof. J. B. Smith had found it numerous in isolated fields, but did not consider that very much damage had been done. Mr. Johnson reported that it was very destructive in Illinois, but its numbers were materially reduced in June, by a fungous or bacterial disease which spread rapidly among them. Prof. Duggar had observed the same thing in Minnesota and considered that the disease was similar to the febrine of silk-worms. Prof. Webster considered that the chinch-bug was the worst insect of the year in Ohio, but the army-worm came second, and was very abundant and destructive. From all this testimony it was evident that the army-worm was wide spread throughout the states adjacent to Ontario; he did not, however, think that we need dread a very serious outbreak next year, as experience taught us that natural enemies so reduced their numbers as to make their ravages insignificant in the year following one of great abundance, nevertheless it would be well to instruct the farmers that their ground should be well cleaned up, and plowed up as far as possible in the fall in order to destroy the hibernating insects.

The Rev. T. W. Fyles regarded Prof. Panton's paper as a very valuable one to the community, and was personally grateful for the information it contained. He came from England to Canada in 1861, which was an army-worm year, and while visiting a friend at Côte des Neiges took a walk into the country. On his way he noticed a high wall around the college grounds on which was a broad black stripe of tar about three feet from the ground. This struck him as very remarkable, and on asking passers by what it was for, he could get no information. Subsequently he learnt that it was intended as a barrier to keep out the army-worm, and no doubt it proved a very effective check. He thought that a roller might be used with great advantage when the worms were crossing a hard surface, such as a road or lane. The tussock moth he had not found in Quebec until three years ago, when it became very abundant and the willow-trees were covered with the caterpillars. Another closely allied species, *Orgyia nova* had always been oommon in that province.

Mr. Dearness, the President, discussed the question of the migration of the army-worm from marshy lands in dry seasons and mentioned some instances in confirmation of this view.

Mr. H. H. Lyman then read a paper on "The preparatory stages of *Erebia epipsodea*, Butler." (See *Canadian Entomologist*, volume xxviii, November, 1896, pages 274-278.)

Mr. Lyman also presented a paper on some remarkable aberrations in *Colias philodice* and *Vanessa antiopa*, and exhibited the singular specimens referred to. Those of the former species were taken by Mr. Dwight Brainerd, of Montreal, at Edgartown, Mass., in August last. (See *Canadian Entomologist*, volume xxviii, December, 1896, pages 505-6.); the suffused black specimen of *V. antiopa* was captured in British Columbia.

Election of Officers.

The following gentlemen were elected officers for the ensuing year: (See page 2.)

AFTERNOON SESSION.

The meeting was called to order by the President, Mr. J. W. Dearness, at 2.30 o'clock p.m. The following paper was then read by Dr. Bethune:

NOTES ON INSECTS OF THE YEAR 1896.

By Rev. C. J. S. Bethune, Port Hope.

The Army Worm.

The season of 1896 is chiefly remarkable, from an entomological point of view, for the outbreak of the army worm in this Province of Ontario. The insect, in its winged state at any rate, has long been familiar to every collector and is every year more or less abundant. We have all read accounts from time to time of its ravages in various parts of the United States, but hitherto we have been free from any serious invasions in this country. As this year's outbreak is being fully discussed by others, I shall merely mention what has come under my own observation.

On the 17th of July I received the following note from the Rev. Stearne Tighe of Emerald, Amherst Island: "I send you to-day by mail, specimens of a grub that is destroying all grain, etc, on this Island. What is it? Is there any way of destroying it, or arresting its ravages? This Island contains 15,000 square acres, and is at its nearest point two miles from the mainland." I at once recognized the specimens to be the notorious "army-worm" (*Leucania unipunctata*), which had already been reported in the newspapers as having appeared in injurious numbers in various parts of the province. I immediately wrote to Mr. Tighe and informed him of the usual remedies, namely, plowing a deep furrow to stop the onward march of the "army," if it were moving on from field to field, and destroying the caterpillars thus collected by burning with straw spread along the furrow or dragging a log of wood through it; or, if the worms were congregated in a field of grain, treating them with Paris green in order to prevent their going further. The specimens sent to me proved to be badly infested with maggots, the larvæ of a Tachina fly, and only one in consequence succeeded in reaching the chrysalis state, the rest being destroyed by their parasites. If the same proportion of worms were attacked in the fields of Amherst Island, there is not much danger of a repetition of the outbreak next year.

A few days later in the month, specimens of the same "army-worm" were brought to me from a field of grain adjoining my own garden at Port Hope. They were then fully grown and had done a great deal of damage by gnawing the soft grain in the wheat-ears. The farmer, whose crop was thus injured, informed me that the worms had crossed the road in the form of an "army" on a Sunday afternoon (where they had come from no one had observed) and at once proceeded to scatter over the wheat field and climb up

the stalks to the ears. Fortunately the grain was rapidly ripening and soon became too hard for the jaws of the caterpillar and the loss was not so serious as might have been anticipated.

About the first of August the moths began to appear and for a couple of weeks they swarmed in countless myraids. Some Tartarean honey-suckle bushes in my garden were laden with ripened berries; these attracted the moths to such an extent that the twigs were covered with them towards evening and during the night. On being disturbed by shaking the bushes, they would fly out in clouds. The moth has always been familiar to us, and is often taken by collectors when "sugaring" in the summer, but I never before saw it in such abundance.

On writing to Mr. Tighe about this time, recommending the destruction of the moths, which could be attracted by sugar or light, and enclosing specimens in order that there might be no difficulty in identifying them, he replied that the worms had disappeared shortly after his previous communication and no further damage had been done by them. They had, of course, completed their larval period and had gone into the ground to transform into chrysalids, large numbers of them then dying from the internal ravages of parasites.

In addition to the good work of the Tachina flies, which resemble the ordinary house-fly and appeared in swarms over infested fields, the worms were attacked by several species of predaceous insects, and were also devoured in large numbers by the English sparrow, which in some localities visited the army-worm districts in great flocks.

The Tussock-worm.

Another insect which attracted much attention this summer and brought out many articles and letters in the newspapers, was the Tussock-worm (*Orgyia leucostigma*), which defoliated many shade trees in the streets of Toronto. As it has been fully dealt with already by Prof. Panton in his valuable and interesting address, I need not go over the same ground again. During my occasional visits to Toronto, I have noticed this insect for several years past and have drawn the attention of friends to its injurious work on their shade trees. It ought not to be a difficult insect to control as it cannot spread with any great rapidity owing to the fact that the female is wingless and can only crawl a short distance. The cocoons are usually so conspicuous in the autumn after the leaves have fallen and during the winter, that boys could be employed to scrape them off and destroy them. A tree once cleared will remain for a long time free from any further attack. In Port Hope the insect is common enough, but has never been so abundant as to cause any appreciable injury.

The Black Potato Beetle.

At the end of June I received from the Editor of the *Mattawa Tribune*, some specimens of a beetle that was attacking the potato plant in myriads in the neighborhood of Mattawa, Ont. They proved to be the black blistering beetle (*Macrobasis unicolor*, Kirby), a species that belongs to to the same family, Meloidæ, as the "Spanish-flies," which are used for blistering purposes by the medical profession, and that possesses the same vesicating properties. The insect (Fig. 56) is long and slender, about half an inch in length, lack in colour and covered with fine whitish hairs which give it an ashen appearance; these hairs are easily rubbed off and leave the insect quite black. It is a northern species and is much more commonly found in the upper Ottawa region and on Manitoulin Island than in Southern Ontario. In the neighborhood of Montreal it has been very abundant

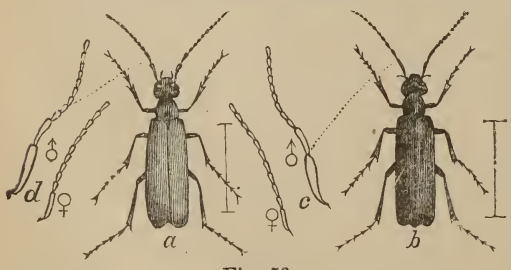

Fig. 56.

on Windsor, or English broad beans, and caused much damage to these plants in some gardens. While at times very destructive to these plants and to potatoes, it is unlike most injurious insects in possessing one good habit at least, and that is its practice of feeding upon the larvæ of the Colorado potato beetle. The question may therefore arise as to whether it does more good than harm. If the evidence should be adverse, then it may be dealt with precisely as its prey, and the "two birds be killed with one stone" by an aplication of Paris green in the usual manner. As far as I know, the black blistering beetle has only one brood in the year, and therefore only attacks the food-plant for a limited period, whereas the Colorado beetle has a succession of broods throughout the season, and never ceases its depredations from the time when the plants first appear above the soil in spring, till they are ready to be dug in the autumn.

Miscellaneous.

For some ten years or so the apple-tree tent-caterpillar (*Clisiocampa Americana*, Harris) (Fig. 57) has not been seen in the neighborhood of Port Hope, but this year it has put in an appearance again and I have observed a few of the moths. In Peterborough and about Toronto it has been quite numerous and destructive. Formerly it was one of the worst pests of the fruit grower that we had, and its webs were to be seen in spring and early summer on apple, pear, plum and cherry trees, and especially upon the wild varieties of the two latter. One spring, however, they were practically exterminated. The tiny caterpillars emerged from the eggs, which are laid in "bracelets" (Fig. 57, *c*) around twigs of the affected tree, at the same time as the leaf buds first opened and at once began to devour them A few days later there came a severe frost which was too much for the tender little worms and they were all killed, giving us an immunity from the pest for a number of years. Now that they have begun to appear again, it will be well for fruit growers to be on the look out next spring and to destroy every "tent" with its inmates as soon as it is discovered.

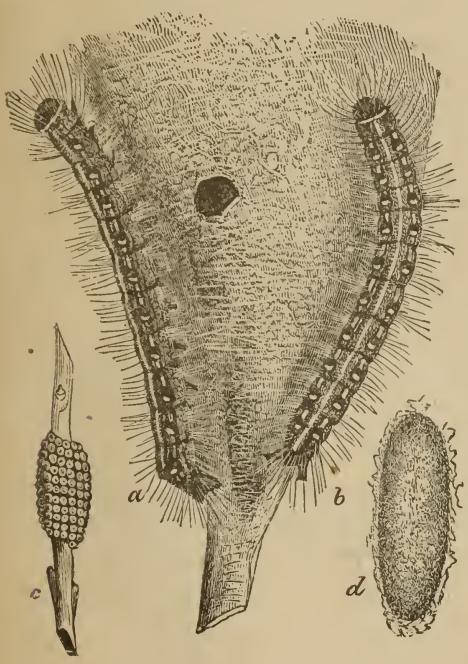

Fig. 57.

Grasshoppers, which were very numerous and did a great deal of damage to pastures, and hay and oat crops, during the two preceding years, were this season remarkably few in numbers and caused no appreciable injury.

Various species of plant-lice (*Aphis*) were excessively abundant and injurious to plants of all kinds during the summer; the long continued hot and dry weather being very favorable to their increase. Even such weeds as the Lamb's-quarter were covered with them and many cultivated flowers in gardens suffered severely.

The Cigar case bearer (*Coleophora Fletcherella*) was found in June upon some neglected apple trees on the edge of a field near Port Hope. This pest which has been a serious one in some localities during the last few years, is evidently spreading in Ontario and should be carefully looked for in spring and early summer. A full account of the insect and the best modes of dealing with it is given in the report for 1895 of Dr. James Fletcher, the Dominion Entomologist and Botanist.

The Fall Web-Worm (*Hyphantria textor*), (Fig. 8) which has been for many years excessively abundant on ash, elm and many fruit trees, has this year been quite scarce about Port Hope, but in the neighborhood of London,—as our president Mr. Dearness relates—it has been conspicuously prevalent and many tree have been covered with immense webs. How to account for these remarkable changes in the numbers of injurious insects from scarcity or abundance in one year to the reverse in the next is one of those puzzles which may well employ the attention of the thoughtful entomologist. Sudden changes of temperature as we have seen in the case of the apple-tree tent caterpillar, very hot and very dry weather, an unusally wet and cold season, violent storms, all these no doubt have great influence in reducing the numbers or favoring the increase of some species of insects, and in addition,—perhaps most of all—the increase of the parasites that prey upon the noxious species, and the spread of infectious diseases are great factors in the problem. It can only be solved by patient daily observations of a particular species carried on from year to year by more than one investigator. This is a field of work open to all and one that may result in the acquisition of a knowledge that will be of very great scientific and practical value.

Dr. Bethune also referred to the large number of rare butterflies that had been captured this year and gave a list of their names, with localities and dates. He then read a paper by Prof. Webster, of Wooster, Ohio, who was unable to be present, on "Warning colors, protective mimicry and protective coloration."

It was then moved by W. E. Saunders, and seconded by J. A. Balkwill, that "The Entomological Society now in Session at its annual meeting, having learnt of the sympathetic statement of its work and aims made by the Hon. John Dryden, Minister of Agriculture, at the time when the grant to the Society was under the consideration of the Committee of the Ontario Legislature, desires the Secretary to convey to the Honorable Minister its sincere appreciation of his kind interest."—*Carried.*

Moved by J. A. Balkwill, seconded by W. E. Saunders, that the Secretary be requested to communicate with the Board of the Western Fair Association, requesting them to continue to offer encouragement to the Schools to make exhibits of the life-history of insects, and that their influence be used on the Fair Boards to encourage similar exhibits.—*Carried.*

Moved by D. Arnott, seconded by W. E. Saunders, that Messrs. Rennie, Balkwill and the President, be appointed a committee to meet the Board of the Young Men's Christian Association, and endeavor to make satisfactory arrangements with regard to the renting of a room for the Society, and the approaches thereto.—*Carried.*

The meeting then adjourned, after having spent much enjoyable time during the sessions on both days in exhibiting rare captures, examining the books and specimens of the Society, and comparing notes on many interesting entomological subjects.

INSECT INJURIES TO ONTARIO CROPS IN 1896.

By James Fletcher, Dominion Entomologist, Ottawa.

There is never a season when serious loss does not occur in some part of Canada from the attacks of our numerous insect enemies. There is, however, during a succession of years great fluctuation in the amount of insect presence in any one locality. New pests develop or old ones reappear after a period of absence, and then again sometimes suddenly disappear. Day by day additions are being made to the mass of accumulated knowledge by the use of which the injuries of insects can be prevented. The importance

of the study of Practical or Economic Entomology is now widely recognized by all the civilized nations of the world. This confidence in a branch of science not taken up by many investigators is undoubtedly due to the fact that those concerned have found by experience that they are able to receive useful advice from those who have made a special study of the lives of insects, by which they are enabled to save a larger proportion of their crops than would otherwise be the case, and thus increase their incomes.

It requires many years of close study and constant observation before one can become familar with all the different attacks by insects which may demand the attention of a farmer or gardener even in a single season; but the general principles upon which remedies are applied can soon be learnt, so as to prevent foolish mistakes. A fact which must never be forgotten is that all insects have their mouth parts formed after one or other of two plans only. In one class, solid food is eaten by means of jaws, with which it is bitten off from the object attacked; in the other class, liquid food, such as the sap of plants or the blood of animals, is sucked by means of a hollow tube-like beak. It is most necessary to remember these elementary facts, because in accordance with them all active remedies are devised. For biting insects, some poisonous material is placed on their food, so that when this food is eaten by the insects they may be destroyed. For sucking insects, this method would be useless, because, having no jaws, they can feed only on liquids, for which they have to sink their sharp beak-like feeding tubes beneath the surface of the object attacked. For this class of insects, substances which will kill by simply coming in contact with their bodies must be used.

Farm crops in Ontario during the past year have not suffered from any new pests, but there has been as usual considerable loss, which might have been prevented, had the attacks been promptly reported and the proper remedial measures adopted. The three most striking infestations of the season were grasshoppers, army-worm and a local outbreak or rather increased abundance of the Tussock moth in Toronto. Under the headings of the different classes of crops, attention is called here to those which have been most frequently complained of.

Cereals. The wheat crop of the Province has been little affected by insects, and although different kinds have been mentioned by several correspondents, there has been no serious outbreak. The Wheat-stem Maggot (*Meromyza Americana*, Fitch), was conspicuously less abundant and the American frit-fly (*Oscinis variabilis*, Loew.) was not only not mentioned, but it was impossible to obtain a single specimen for examination even in localities which were badly infested in 1890

Grasshoppers were stated to be the cause of some injury to wheat, but the crops most injured by these insects were oats and hay. It is well to make special mention of the Hessian fly (*Cecidomyia destructor*, Say), fig. 58, which has been present in several places, and farmers must be prepared next year, if its injuries increase, to adopt the well known remedies of sowing their fall wheat later (about the third week in September) and burning carefully all screenings and dust from threshing machines. The Wheat Midge (*Diplosis tritici*, Kirby), fig. 59, which has been heard little of for the past six or seven years, again put in an appearance in one or two localities. This, also, will be largely controlled by the systematic burning of the rubbish from threshing machines.

Fig. 58.

Oats have, perhaps, suffered from insects more than any other of the small grains The Grain Aphis (*Siphonophora avenæ*, Fab.) was unusually abundant in some places. Oats were also among the crops mentioned by several who wrote concerning the army-worm (*Leucania unipuncta*, Haw.) One of the most notable outbreaks of the year 1896 was by the

caterpillars of this insect. There was hardly a county in the Province where it was not reported either as a caterpilar attacking crops or as a moth which had drawn attention by its excessive numbers. This pest has been treated at length by Prof. Panton in the present report, so need not be mentioned further here, except to draw the attention of those interested to the excellent bulletin lately issued by Prof. Clarence M. Weed of the New Hampshire Agricultural Experiment Station. It is interesting to learn from this bulletin that in 1770 in the celebrated occurrence of the army worm in New Hampshire, the same remedies which we most rely on to-day, namely, trenching around fields infested and destroying the caterpillars in pits dug at intervals in the trenches were practised by the farmers of that State. As is almost invariably the case, the superabundance of the army-worm this year was much reduced by the natural enemies which always prey upon this species.

Fig. 59.

At the late meeting of the Association of Economic Entomologists held at Buffalo, N.Y., Dr. J. B. Smith stated that the army-worm had appeared in New Jersey in some numbers, but only in isolated localities. In Canada, in almost every instance where invasions of this insect have been recorded, the injury has been done by a brood which appears in the larval form during the month of July and in the beginning of August; but Dr. Smith stated that it was not always the same brood which did the damage in New Jersey The first brood seemed to be the injurious one in a southern county of the State, reports having been received as early as May. At other localities in the State injury was noted in July and as late as early in August. This is practically the same as is the case in some of our northern counties of Ontario The most interesting record, however, is given by Mr. A. H. Kirkland, of the Massachusetts Gypsy Moth Commission, who stated that "the army-worm had been seriously injurious in many parts of Massachusetts and had damaged a large portion of the cranberry crop. He writes Sept. 3 that at Hingham, Mass, a third brood of army-worms was then threatening to be as destructive as any that preceded it. He found them at that time of all stages from quite young to nearly mature." (*Entomological News, VII*, 1896, p. 310.)

Fodder crops. Early in the season grasshoppers of the three common species, the Red-legged locust, fig. 60, the Two-striped locust, and the Lesser Migratory locust, were noticed to be remarkably abundant throughout Ontario and Quebec and in parts of Nova Scotia. These species are always somewhat prevalent, but great anxiety was felt in June last when their ravages were seen in pastures and hay fields. Clover was badly eaten in some districts early in the month and also wheat, oats and barley. Later in the summer corn, beans, turnips, and even hops were attacked. There was every appearance in July that the losses would even exceed those of 1895, but early in August it was clear that for some reason the grasshoppers were much less numerous than they had been. Several correspondents made the same report, and a few of them observed that parasites were waging an effective warfare against the locust tribes. Doubtless the sudden disappearance of these pests was due to the great increase of four of their natural enemies. One of these is a fungous disease (*Empusa grylli* [Fresenius] Nowakowski), which causes its victims to crawl up to the tops of stalks of grasses and other plants, where, grasping the stem firmly with their legs they die and their bodies become rapidly filled with a dry, mealy substance, which is really myriads of the spores of the parasitic fungus. The body of the locust soon dries up a the spores are distributed by the wind, each mummified carcass thus becoming a source infection to all other locusts which come near it. In addition to the above fungus thr other parasites—insects—were unusually abundant. One of these was a Tachina fly, fig 6 which was described as following the locusts closely and darting down, laying its whit

Fig. 60.

eggs on their bodies. From these eggs in a short time hatch white maggots which feed inside the bodies of their hosts until full grown, when they force their way out and, falling to the ground, which they enter a short distance, they pupate, and change to flies either the same autumn or the next spring. Prof. Riley describes graphically the operation of egg-laying by one of these Tachina flies, and much the same thing was observed by Mr. J. E. Richardson of Princeton, Ont., last July. Prof. Riley says: "The slow-flying locusts are attacked while flying, and it is quite amusing* to watch the frantic efforts which one of them haunted by a Tachina fly, will make to evade its enemy. The fly buzzes around waiting her opportunity, and, when the locust jumps or flies, darts at it and attempts to attach her egg under the wing or on the neck. The attempt frequently fails, but she perseveres until she usually accomplishes her object. With those locusts which fly readily, she has even greater difficulty; but, though the locust tacks suddenly in all directions in its efforts to avoid her, she circles close around it and generally succeeds in accomplishing her purpose, either while the locust is yet on the wing, or, more often, just as it alights from a flight or a hop." Locusts infested with these parasites are more languid than they otherwise would be; yet they seldom die until their unwelcome guests leave them of their own accord.

Fig. 61.

Probably the most efficient worker in keeping down the undue increase of grasshoppers is the Locust Mite (*Trombidium locustarum*, Riley), and it has been extremely prevalent and very often observed during the past summer. As it is seen attached to grasshoppers, generally at the base of the wings, it bears little resemblance to an insect and few recognize it as such the first time they examine it. The bright red swollen bag-like bodies are really the larval form of the Locust Mite, and are possessed of six weak legs, as may be discovered by examining them closely. (See figs. 62 and 63, opp. page 64) The mouth parts are very poorly developed, and, when once the mites have attached themselves to their host by means of their beak-like mouths, they remain unmoved, living on its blood until full grown. By these little parasites vast numbers of locusts are destroyed. When ready to assume the pupal condition, they detach themselves, and, falling to the ground, crawl under some shelter to complete their transformations. Gradually swelling and changing their form slightly, the mites pass through the pupal stage inside the larval skin; new legs, mouths and other organs, of a different nature to those possessed by the larvæ, are formed under the old skin, and finally this latter bursts and releases a creature very different from and much more active than the larval form. It has now eight legs and is a true *Trombidium*. The perfect mites are very conspicuous and draw attention by their velvety, bright scarlet bodies; they are frequently spoken of as "Scarlet Spiders" when sent in for identification. In this stage they are equally useful allies to the farmer as in the larval form, for while they do not attack the full grown locusts, they seek out their eggs in the ground and destroy large numbers of them. They pass the winter in the mature form and are frequently seen crawling over the ground in spring.

In May the female lays a mass of between 300 and 400 small, round, orange eggs in a cavity an inch or two beneath the surface of the ground. The young, as stated above, have six legs only and are at first exceedingly minute but very active. They crawl about until they find a locust, to which they attach themselves, mostly at the base or along the principal veins of the wings. Here they swell by degrees until their legs become almost invisible, and this is the time they are most often noticed. There has been considerable confusion as to what is the proper name of this mite. In the first place, it was not known, until Prof Riley in 1877 worked out the life history of this species, that the bag-like bodies with six legs only, which were so often found attached to locusts, and which were classified under an entirely different genus, *Atoma* (= *Astoma*) of Latreille, were merely the immature condition of the little red mites with eight legs which were found devouring the eggs of locusts in the ground, and when this fact was discovered there was still room for con-

* The locust might well say here, "It's fun for you but death to me."

fusion as to whether it should be called by the specific name first given to the larva when named *Atoma gryllaria* by Dr. Le Baron in 1872, or by the name of the perfect insect described in full by Dr. Riley after its true nature had been found out.

In Murray's *Aptera*, without date but bound up with Official British Museum Advertisements dated October, 1876, and presumably issued in that year, this mite is treated of under the head of *Trombidium gryllarium*; but, in Mr. Samuel Henshaw's Bibliography of American Economic Entomology, 1890,—a most valuable and carefully prepared work, which will probably be accepted as authoritative by all Economic Entomologists — *Astoma gryllarium* is made to equal *Trombidium locustarum*, and it is, therefore, well for us to adopt the latter name and to drop altogether the name *Atoma* or *Astoma gryllarium*, referring to the stage found attached to locusts merely as the larval stage of *Trombidium locustarum*, Riley.

Besides those mentioned there are many other different kinds of parasites which infest locusts, but none perhaps which excite more surprise when their strange habits are explained than the curious creatures known as "hair snakes" or "hair worms," with their slender hair-like bodies from six to twelve inches in length tapering to each end and only at most one twenty-fifth of an inch through at their greatest diameter. These may be seen sometimes crawling on or coming out of the ground in large numbers after a shower of rain, sometimes along the edges of streams, either coiled and knotted up one or many together, or singly swimming close to the surface of the water with an undulating snake like motion. Dr. Leidy, in his very valuable article on *Gordius* which appeared in the American Entomologist for 1870, when referring to the habit of these worms of coiling themselves in intricate masses, suggests that "similar knots no doubt were the source of the scientific name of the worm being applied to it by Linnæus from the fabled Gordian knot of antiquity. The *Gordius*, however, not only resembles the latter in the intricate condition into which it sometimes gets, but its history is yet in part a Gordian knot to be unravelled.'

These worms are not, by any means, unfamiliar objects in the country, and various misconceptions as to their sudden appearance in large numbers and as to their origin are widely prevalent. They are frequently sent for identification with the statement that they had fallen from the clouds in rain. The commonest error, however, is that they are horse hairs which, having fallen into water, have "come to life." It is not necessary here, of course, to point out the absurdity of this statement. "Such a transformation is an utter impossibility. No dead organic matter can thus be changed into a living creature. It is a law of nature that every animal being, from the lowest to the highest, has its commencement in an egg." (Lintner).

Several articles more or less complete have appeared on these worms. By far the fullest is the extended account in the First Report of the United States Entomological Commission, 1878, where probably nearly all that is at present known of their mysterious life history is collected together, and good illustrations are given. The hair worms,—of which there are several species, found parasitic in the bodies of insects of nearly all the different orders, such as the Orthoptera, Hymenoptera, Coleoptera, Lepidoptera and Diptera,—belong to the Entozoa or intestinal worms. They have a very remarkable cycle of development, which may be briefly summed up as follows: The eggs are laid in water, and the exceedingly minute young worms float about in a free state until they find the larvæ of some aquatic insects into the bodies of which they effect an entrance, as was observed by Dr. Meissner, a German scientist, through the delicate membrane at the joints of the legs. They then work their way gradually among the muscles and other organs throughout the body of their host and after a time become quiescent and encysted so as to resemble their former condition just before leaving the egg, and, as Dr. Meissner says, recall to mind the similarly encysted Trichinæ in the muscles of man and the hog. Mr. A. Villot added materially to our knowledge of these curious creatures and found that, when insects infested with these encysted larvæ were eaten by fish, the bladder-like cysts were dissolved by the process of digestion and the young worms set free in the intestines of their new host, at once bored by means of spines around the head into the mucous layer of the intestines of the fish, where they became again encysted. In the next stage, which

is not reached till spring, five or six months afterwards, they live a free-swimming aquatic life. To obtain their liberty, they first free themselves from their cysts in the lining of the intestines and pass into the intestinal cavity of the fish, whence they are carried out with the fæces into the water. Here remarkable changes take place. Mr. Villot says: "The numerous transverse folds of the body disappear and the worm becomes twice as long as before; its head armature disappears; the body becomes swollen, milky and pulpy. It remains immovable in the water for a variable period and then increases in size. The integument grows harder and when about two inches long the worm turns brown and begins to move."

At this point in the life history of these creatures all actual observation ceases, and it is only a matter of conjecture how these parasites can find their way into the bodies of such insects as locusts, tree crickets and beetles, many of which live preferably in dry places. It has been suggested that the worms can travel long distances on foliage and other surfaces when wet with rain or dew. It must be acknowledged that there is room for much careful investigation as to the habits of these useful allies of the farmer. What is well known, however, is that they are certainly parasites which occur frequently inside the bodies of many of our injurious locusts, and during the past season were so abundant in some places—as at Ottawa—that they could be found in varying numbers from one to five, generally two or three, in almost every large-bodied locust that was examined during the months of September and October.

With the dark-colored *Gordius* worms are usually found inside the same hosts some smaller and slenderer white specimens which are very similar in general appearance; they belong to another genus (*Mermis*) differing in many respects as to structure and some stages in their life histories, but equally useful with them from their habit of living as parasites inside and ultimately destroying locusts and grasshoppers as well as other insects.

In connection with grasshoppers mention must be made of the rather serious ravages of the Gray Blister beetles (*Macrobasis unicolor*, Kirby), fig. 56. These have been abundant in some localities during the past season and have infested fields of potatoes and beans; they were also troublesome on the Siberian Pea tree (*Caragana*), now grown considerably for hedges, also on the large-leaved and ornamental Aralias, *A. spinosa* and *A. Chinensis*. In the larval form these beetles are parasites in the egg pods of locusts, so that an abundant occurrence of blister beetles indicates that the armies of destructive grasshoppers are much smaller than they would have been but for this good feature in the habits of these otherwise injurious insects. The blister beetles generally appear suddenly and in large numbers, and if they are not attended to at once they quickly do much harm to a crop. Prompt spraying or dusting with Paris green are effective and where practicable great numbers may be beaten into pans containing water and coal oil. A long piece of Caragana hedge was saved in this way by giving it two beatings a day for a week in a locality where Paris green could not be obtained.

There have been other injuries to fodder crops: The Clover Root-borer (*Hylesinus trifolii*, Miller) occurred at one locality in the County of York, and the Clover-seed Midge (*Cecidomyia leguminicola*, Lintner) was rather more destructive than usual in the clover seed growing districts. Even in the eastern part of the Province its presence was clearly discernable by the appearance of the fields at the time of blooming. Reports vary as to the prevalence of the pea weevil, but, on the whole, while it seems to have been less injurious in the west, specimens have been found this year in pease grown as far east as Ottawa, which is a very rare occurrence.

Root Crops.—The root crops have been affected somewhat both by weather and insects. There has been mention of white grubs (*Lachnosterna*) Fig. 64, in potato and carrot fields, and, as mentioned above, grasshoppers and blister beetles have done their share of injury. The outbreak of most interest under this head was of the Clover Cut-worm (*Mamestra trifolii*, Esp.), which appeared during August in large numbers in the district lying around Rice Lake. The crops attacked were turnips, mangels and peas. The loss was greatest in pea fields, the leaves and even the fleshy tissues on the outside of the pods being entirely consumed. The caterpillars which vary very much in color and ornamentation first appeared about the first of August, and were in such numbers that they had to migrate

to obtain food, and for this reason were thought by some to be the army worm One correspondent wrote, "The green leaves and the vines themselves were eaten, but my peas were too nearly ripe before they were attacked to be much injured. I never before saw anything like it. The ground was literally alive with the crawling insects. We put

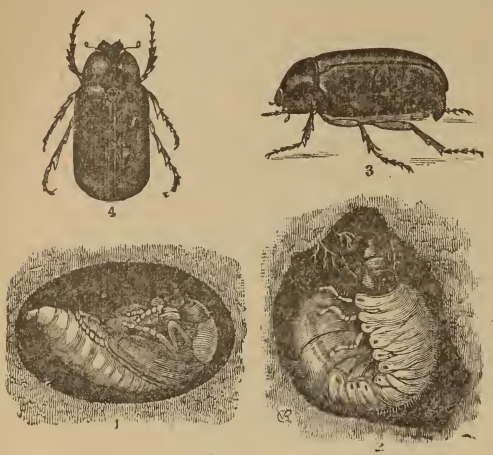

Fig. 64.

Fig. 65.

Paris green on the turnips, and this doubtless helped, but the insects were so numerous that one set after another took the place of those killed. Turnips near peas were injured most; they put forth a new set of leaves, but the growth of the roots was stunted, and they were only half a crop."

Turnips were also slightly injured by the Zebra caterpillar (*Mamestra picta*, Harris) which is a very general feeder, being found also on cabbages, potatoes, clover, celery, lucerne and many other plants. The caterpillar is a most showy insect (Fig. 65*a*); when full grown nearly two inches in length, velvety black on the back with the sides gaily ornamented with golden yellow lines connected by wavy white threads; the head and feet are chestnut red. When ready to transform the caterpillar spins a loose cocoon of silk with earth mixed with it and changes to a black chrysalis. The moth (Fig. 65*b*) has glossy brown upper wings and the lower ones are whitish. The eggs are laid in large clusters beneath leaves and seem to be, at Ottawa at any rate, much more infested with egg parasites than those of almost any other insect. In September, 1892, I found upon a plot of Bokhara clover (*Melilotus alba*, Lam.) hundreds of clusters of the eggs of this moth, which were so much parasitised by two minute hymenopterous insects, *Trichogramma pretiosa*, (Fig. 66), and a new species of *Telonomnus*, that not one per cent. of the eggs gave caterpillars. The only remedies which can be applied for the Zebra caterpillar are arsenical mixtures, and this species seems to be particularly resistent to the effects of all poisons so far experimented with. There are two broods in the year, the latter of which may be noticed on fine days long after the first severe frosts.

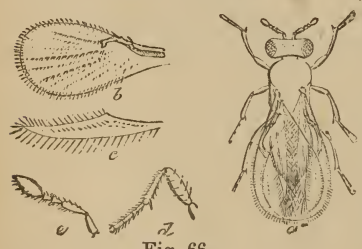

Fig. 66.

VEGETABLES.—In gardens the regular yearly pests such as cut worms, turnip flea, Colorado potato beetle, and the cabbage caterpillars have required attention. The species of cut-worm whose injuries have been most conspicuous, has again this year been the red-back cut-worm (*Carneades ochrogaster*, Gn.) This is a large and widely distributed species which feeds upon almost every kind of succulent vegetation. It was particularly destructive to newly set cabbages and tomatoes and to young beet root, as well as many annuals in the flower garden. Careful trial was made this year of the poisoned bran remedy, and good results were obtained. Bran or oat-meal was moistened with sugar in water sufficiently to allow of being ladled out with a spoon. Into this sufficient Paris green was

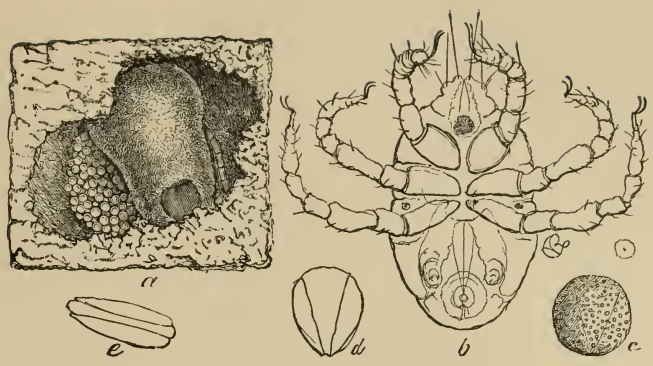

FIG. 62.—TROMBIDIUM LOCUSTARUM.—*a*, female with her batch of eggs; *b*, newly hatched larva—natural size indicated by the dot within the circle on the right; *c*, egg; *d*, *e*, vacated egg-shells (after Riley).

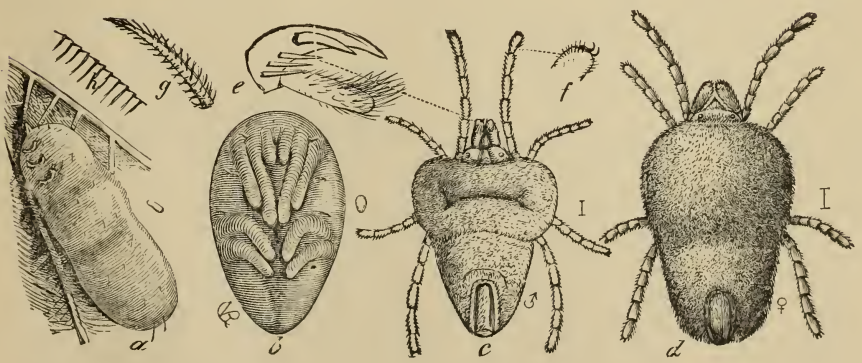

FIG. 63.—TROMBIDIUM LOCUSTARUM.—*a*, mature larva when about to leave the wing of a locust; *b*, pupa; *c*, male adult when just from the pupa; *d*, female—the natural sizes indicated to the right; *e*, palpal claw and thumb; *f*, pedal claws; *g*, one of the barbed hairs; *h*, the striations on the larval skin (after Riley).

(*See page 61.*)

Phelps Lake in Illinois, August, 1894. Dead Fish and Mussels. (After Forbes.)

Phelps Lake, August, 1895. After being brought under cultivation. Corn and Pumpkins. (After Forbes.)

(*See page 84.*)

stirred to give it a decidedly green tinge. A spoonful of this mixture was placed at intervals of six or eight feet along rows of peas, beets and carrots, which were being rapidly destroyed by these cut-worms. The results were most satisfactory, the poisoned bran was apparently so attractive to the caterpiliars that only two or three plants were afterwards cut off and the bran was eaten instead, many caterpillars being found dead near the bran but some distance under the surface of the soil, where they required to be looked for with some care.

The "Black Army-worm" (*Noctua fennica*, Tausch) was abundant in the neighborhood of Picton, Ont., where it did much harm to peas and other garden plants, including raspberries and other small fruit.

Squashes and cucumbers have been much injured in western Ontario by the striped cucumber beetle (*Diabrotica vittata*, Fab.), and the true squash bug (*Anasa tristis*, De Geer) Fig. 67, was reported as very troublesome at Hamilton. When the plants are young and small, probably the best remedy is to cover the hills with a square of mosquito netting, or cheese cloth, supported by two or three sticks stuck in the ground and with the edges held down with a few handfuls of earth. When the plants get too large to be so confined, the insects may be kept away to a measure by sprinkling over the hills ashes or land plaster with which coal-oil has been mixed. Hand-picking for the Squash Bug must also be resorted to; for this purpose shingles are placed near the plants for the bugs to hide under.

FIG. 67.

FRUITS.—Fruit insects in Ontario have been decidedly less noticed during the past season than for many years previous. This is probably due to the enormous crop which has been reaped; timely rains and fair weather for fruit crops seem to have prevailed over the whole Province. As in the past those who sprayed carefully, obtained paying returns. Although, on the whole, insect enemies have demanded less attention than usual, it is feared that carelessness in orchard management by which defective and infested fruit was left unpicked from the trees or to rot on the ground, may be followed next year by a large increase in the number of injurious insects which will in all probability infest a much smaller crop over the whole Province.

In western Ontario the second brood of the codling moth was particularly destructive. The work of the plum curculio, owing to the enormous crop of plums, was not so manifest as usual, but where looked for, could usually be found, In some districts where plums are not much grown, this is by far the worst enemy of the apple crop. The apple curculio (*Anthonomus quadrigibbus*, Say.) is not a very frequent enemy of the apple in Canada, seeming to confine its attacks more particularly to the fruit of the hawthorn. Two new attacks upon apples of considerable interest to fruit growers have to be recorded. The first of these by the caterpillar of a small moth which has not yet been bred to maturity, has affected to an appreciable degree the apple crop of certain localities in British Columbia, and what may possibly be the same insect has been found in a few instances at Ottawa and Montreal, but the injury to the fruit was much less serious than in the British Columbian apples, where the caterpillars burrowed in every direction through the flesh of the apple, causing it to decay and entirely destroying it for the market. The outside of the fruit was also gnarled with sunken depressions where the caterpillars had entered, and in many instances, this spot was marked with a white deposit similar to birds' droppings. This latter fact, however, is comparatively of small consequence, because the fruit bearing these deposits is already destroyed by the discolored burrows of the caterpillars which run in every direction through the fruit for which reason the name of "apple fruit-miner" is suggested. Judging from the nature of the injury to the apples this season, this is certainly a much more serious enemy than the larva of the codling moth, and the condition of an infested apple is much more nearly like that produced by the apple maggot (*Trypeta pomonella*, Walsh) for which indeed it was mistaken by some observers, but from which it is entirely distinct. The second attack new to this country, is by the true "Apple Maggot" which this year for the first time on record has infested cultivated apples in Canada in the orchard of Dr. D. Young, a careful observer of insect habits, living at Adolphustown, Ont.

At the end of October Dr. Young sent me some apples containing a few larvæ and showing undoubtedly the work of this injurious insect which he had never found in his orchard before this season. Three or four varieties only of apples were infested. It is important to notify fruit growers as soon as possible of the occurrence of this insect in our orchards as an apple pest and to give from the experience of growers in the New England States the measures which have been found most successful in fighting against it. The insect was first described by Walsh in his first report as State Entomologist of Illinois in 1868; but it had been known in the eastern states for several years before that, having attracted attention by its serious injuries to the cultivated apples in New York, Massachusetts, Connecticut and Vermont. Strange to say, although it has never, as far as I can learn, attacked cultivated apples in Canada until this year, it is common in collections of insects and occurs abundantly in the fruit of hawthorn in many localities. In 1887 I bred the fly from haws found at London, Hamilton, Toronto, Montreal and Ottawa. In 1888 the fruit of the hawthorn bushes on the Experimental Farm was so much infested by the maggot of this fly and the grub of the apple curculio that it was almost impossible to find a sound fruit. It is, however, by no means a singular habit for an insect to confine itself to a certain food plant in one locality when others are growing close to it, which elsewhere are preferred by the same species.

The most important articles on this subject have been written by Walsh (Ill. Rep. I.), Comstock (Rep. U. S. Comm. Agric., 1881-2), and particularly Prof. Harvey, who wrote a long and complete account in the annual report of the Maine Agricultural Experiment Station for 1889, where the full life history of the species is for the first time detailed. The life of this insect may be said to be as follows: The perfect flies begin to emerge about the first of July and continue to appear until about the middle of September; eggs are laid at once, those first deposited producing the earliest flies the following season. The egg is forced through the skin of forming apples by means of the horny ovipositor of the females. The maggots hatch and run tunnels all through the fruit of the apple leaving discolored brown tracks wherever they go. In this way the fruit is rendered quite unsaleable and ripens prematurely. The maggots are full grown in about five or six weeks, and as soon as the fruit falls they leave it and entering the ground a short way turn to puparia and in that condition pass the winter. Early and sub acid varieties of apples seem to be preferred, but late and winter varieties are also attacked. When the late varieties are infested, the maggots do not emerge until sometime during the winter after the fruit has been stored. In all Prof. Harvey's investigations he never saw an apple hanging on the tree from which the maggots had emerged. This is an important point because it shows the value of collecting all fallen fruit as soon as possible after it falls and destroying it so that the maggots may not leave and go into the ground to pupate. There are different ways by which this may be done. They may be collected by children and fed to stock, or, if there is no stock to eat them, they may be buried in a deep hole and afterwards covered up so that the flies may not be able to emerge the following season. Sheep or swine kept in the orchard from about the 15th July would save much labor by eating the fruit as soon as it fell to the ground, and poultry would render good service by devouring the fruit, maggots and puparia beneath the trees. The larvæ do not penetrate more than an inch or an inch and a half beneath the surface, so would easily be scratched out and found by chickens. Prof. Harvey draws attention to some important facts in the habits of the apple maggots. He points out that the perfect insects are rather sluggish and that the species does not seem to spread very rapidly in a new locality from orchard to orchard nor even from tree to tree in an orchard. He shows clearly, however, that it is a most serious pest from the way in which infested fruit is rendered quite useless for human food. The females are very prolific, each one laying from 300 to 400 eggs, and the young maggots hatching inside the apples are inaccessible to any wholesale method of treatment such as spraying. Up to the present no parasites have been detected feeding on the insect. Almost all varieties of apples are liable to attack and as many as a dozen maggots have been found in a single fruit. Under remedies, he says, "The only chances are to destroy the larvæ and pupæ. The larvæ are found abundantly in windfalls, and the pupæ in bins and barrels where fruit has been stored. Destroying wind-

falls would prevent the maggots going into the ground, and burning refuse from bins and barrels would dispose of those in stored fruit. These methods are practical, easily applied and should be rigidly enforced." "There is no lazy way to check this insect. It will have to be done by a direct, squarely-fought battle. We firmly believe we have in the careful destruction of the windfalls the means of destroying the pest."

The Cigar Case-bearer (*Coleophora Fletcherella*, Fernald) has been decidedly less abundant this season than for three or four years previously. Good results from spraying are reported by Mr. Harold Jones of Maitland, Ont., who noticed the young caterpillars moving on the bark on May 2 and at once sprayed with kerosene emulsion and practically cleared his orchard. Mr. W. H. Little, of Trenton, Ont., says it has been numerous in his orchard for about four years, but has kept it within control by spraying with Bordeaux mixture and Paris green. The insect is reported from Goderich and Port Hope in restricted localities. It was found at the latter place by Dr. Bethune in numbers upon an isolated apple tree against a fence, a long way from any orchard or garden. At Port Hope some specimens of a small parasite were bred from the cases by Mr. Wm. Metcalfe. These have been identified by Mr. W. H. Ashmead as *Microdus laticinctus*, Ash.

The Pear Slug (*Selandria cerasi*, Peck), this old enemy of the fruit grower, seems to have been unusually abundant during the past summer in all parts of the Dominion where prunus fruits are grown. Mr. L. A. Woolverton states that the second brood is more troublesome than the first and suggests that the reason is because at the time of the year when it appears, fruit growers are so busy picking and marketing fruit that it is almost impossible to find time to spray with Paris green.

After the exceptionally heavy crop of all fruits throughout the province this year, it is almost certain that the next season's crop will be light; the careful grower who attends to all such *little* matters as spraying will then most certainly reap a rich harvest at the expense of his less thoughtful neighbours. It is in the off years that the skill of the horticulturist is called forth; he cannot, it is true, always make his fruit trees set fruit and bear, but he can in many instances by skilful management materially improve the quality of his crop, and it is in years when the crop is small that he has the greatest latitude to show his superiority over the easy-going grower who trusts to luck and lets things come as they may.

Fig. 68.

Grapes have suffered somewhat from the Phylloxera. Mr. Woolverton found the leaf gall inhabiting form unusually abundant throughout the Grimsby district. In many cases hundreds of vines on a plantation had their foliage covered with the galls of the louse—Fig. 68. In the September number of the *Canadian Horticulturist* appeared a figure of a branch of a grape vine infected by Phylloxera. There are few insects as well known as the notorious *Phylloxera vastatrix*, Planchon, which has been the cause of such enormous losses to the grape growers of France, Italy, Spain, and other countries in Europe. This pernicious insect is a native of America, whence it was introduced into Europe and where it now commits terrible ravages, far exceeding anything that has ever been recorded here in its native country. The life-history was worked out by the late Dr. C. V. Riley and has appeared in several of our previous reports. There are two forms of this insect with very different habits. The first produces greenish red or yellow galls on the foliage, as shown in the illustration kindly lent by the editor of the *Canadian Horticulturist*; the other, which is the most injurious, attacks the roots, causing swellings on the young rootlets, which

finally decay and thus the root system of the vine is destroyed. The winter is passed in a dormant condition on the roots. In spring there are five or six generations of wingless females, all of which bear young without the intervention of males. In July some winged females are produced which leave the roots and fly to other vines, when each one lays a few eggs of two different sizes, from which are produced in about a fortnight perfect males and females. These are born for no other purpose than reproduction and are without means of flight or of taking food. Each female lays one egg, from which comes an egg-bearing, wingless female, thus beginning a new circle of existence. The winged females which are first seen in July continue to appear throughout the season and are most abundant in August.

Occasionally the underground form leaves the roots and produces galls on the leaves. These are more abundant in some seasons than in others, as during the past summer—but the Grape Phylloxera cannot from past experience be considered a serious pest in Canada, although at rare intervals there has been a loss of many vines in some vineyards which have been badly infested. The only remedy which has been adopted in this country has been the destruction of badly infested vines or the removal of gall-bearing leaves from those which are less severely attacked.

Another insect which has been locally troublesome on grape vines in western Ontario is the Grape Thrip (*Erythroneura vitis*, auct.). Mr. Woolverton thinks that it is increasing steadily year by year. It has been treated effectively by spraying vines carefully with kerosene emulsion before the young of the first brood acquire their wings.

The two broods of the Strawberry Leaf-roller (*Phoxopteris comptana*, Frol.) Fig. 69, did considerable injury to strawberry beds around Picton, Prince Edward County, in June last and in the autumn. Luckily for Canadian growers of small fruits it is a rather rare occurence for this insect to be sufficiently abundant to attract notice, but in some of the northern United States it is considered the most destructive of the enemies of the strawberry grower. The caterpillars were found on the strawberry plants towards the end of June and were not noticed until they had injured one field of four acres sufficiently to give the plants the appearance of being attacked by a severe blight or as if fire had been over them. The caterpillars when full grown are about one-third of an inch long and vary in colour from yellowish-brown to dark-brown or green. They fold the leaves of the strawberry by drawing the upper surfaces together and fastening them with strands of silk. They then eat away all the green inner surface of the leaves, giving the beds a brown and seared appearance.

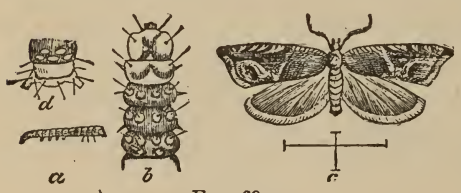

Fig. 69.

Mr. John Craig, of the Central Experimental Farm, who visited some of the Picton plantations on the 4th of July last, found that many of the caterpillars were full grown and ready to pupate; others, however, were small and would not turn to chrysalids for certainly a week or two later. Moths emerged at Ottawa from infested leaves sent from Picton between July 15 and 25, a period which would probably be extended at any rate till the end of the month in the fields. Eggs laid by this brood of moths produced caterpillars which again attacked strawberry beds severely at Picton in the autumn. As a remedy for this insect it has been recommended to mow off and burn the leaves of infested beds directly after the fruit is picked. The leaves containing the caterpillars or chrysalids, would soon dry up and would burn easily. That cutting off the leaves at this season can be done without injury to the plants has been proved by Mr. Craig in some experiments for controlling the strawberry rust. (See *Experimental Farm Report*, 1895, p. 113). It must be done of course before the moths begin to emerge. The second brood can be treated much more easily. When beds are known to have been infested by the spring brood, the plants must be sprayed or dusted with Paris green during August, so that the young caterpillars may be destroyed as soon as they hatch. Should the injuries be noticed only late in the season when the caterpillars are well grown, burning the foli-

age may again be resorted to. The occurence of this insect at Picton was mentioned in the *Canadian Horticulturist* for July last in a letter by Mr. Craig and the remedy of burning the foliage recommended.

Red Spiders (*Tetranychus*, sp.) Fig 70, have been abundant and very destructive in many places particularly during the hot weather in August. There are doubtless many species of mites included under the general head "Red Spider." These minute plant-feeding mites are extremely difficult to control—when the weather is dry and hot. Frequent waterings with a hose where possible have a good effect, and sweet peas in several gardens at Ottawa were saved in this way. Dusting with sulphur also had a marked influence on the mites. Kerosene emulsion applied early to plants known to be infested was perhaps the most fatal remedy, but in large fruit gardens upon black currants and raspberries severe injury was done both by the mites and the frequent applications of the emulsion to the enfeebled foliage. As yet it must be acknowledged no practical remedy has been discovered for these pests when they are abundant and during hot, dry summers.

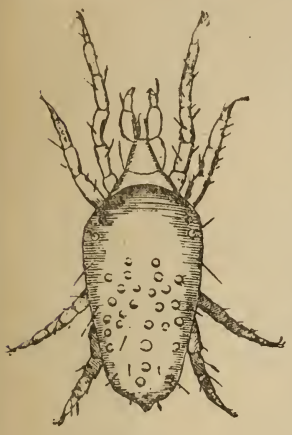

Fig. 70.

The Black Peach Aphis (*Aphis persicæ niger*, E. F. Smith), appeared last year for the first time in Essex County. This year there has been no complaint from that locality ; but I fear that peach-growers from not recognizing the danger of this insect are failing to report its presence. Another occurrence was discovered near St. Catharines in a newly set peach orchard. The owner of the orchard, on having his attention drawn to it, promptly rooted up the trees and destroyed them.

SOME BEETLES OCCURRING UPON BEECH.

By W. Hague Harrington, F.R.C.S., Ottawa.

When so many of our forest, shade and orchard trees are defoliated and disfigured by an endless succession of insect pests it is satisfactory to find one of our most beautiful and valuable species comparatively free from such attacks. At the close of summer the stalwart, handsome beech will be found with its raiment of bright, glossy foliage almost as fresh and unspotted as in springtime, while its neighbours, the maples, elms, etc., are more or less naked and threadbare. Yet, favored as it is, there are several species of moths whose caterpillars find the tough leaves not unpalatable, such as *Hyperetis nyssaria*, A. & S., whose larva was described by Prof. Saunders in the Canadian Entomologist, vol. iii., p. 209, and the pretty little casemaker, *Incurvaria acerifoliella*, Fitch, which at times so seriously infests the maples. (See Trans.-Ottawa Field Naturalists' Club, No. vi., p. 353.) The trunk when injured, or when the trees become weakened by age, is riddled by the boring larvæ of the large Horntail, *Tremex columba*, Linn, one of the most striking of our Hymenoptera, and becomes gradually the feeding ground of a variety of insects. The majority of the insects, however, which I have found infesting this tree belong to the order Coleoptera, and while but few of the species do serious injury to the tree when it is still vigorous, it may not be uninteresting to make a brief record of the species which have been noted by myself, or which have been recorded by Dr. Packard in his Forest Insects (Fifth Report of the United States Entomological Commission, pp. 513-520.)

Trogositidæ.

1. *Trogosita corticalis*, Melsh. An elongated, flattened, brownish beetle, about three-fifths of an inch long, with finely striated elytra, found under the bark of old trees; cannot be considered injurious.

2. *Grynocharis 4-lineata*, Melsh. A more flattened black beetle, about twice as wide as long, and very variable in size, from a little over two-tenths to nearly four-tenths of an inch long. Each elytron has four raised lines, between each pair of which is a double row of punctures. This beetle is found under bark with preceding, and is also harmless.

Elateridæ.

3. *Corymbites cruciatus*, Linn. A handsome "click-beetle," whose larva is one of the wire worms which feed in decaying wood, and which has always been found by me on, or in the vicinity of, beech. It is about half an inch long, head black with the exception of the reddish mouth parts, thorax black with a bright red stripe down each side above and below, body beneath black margined with red, elytra yellow with sutural stripe, short humeral stripe and sinuate band behind middle, black. The black sutural stripe and the transverse band form the cross from which the name is derived.

Buprestidæ.

4. *Dicerca divaricata*, Say. A brownish or blackish bronzy beetle, of rather stout build, from three-quarters to almost an inch long. (Fig. 71.) It is a well-known pest of such trees as the maple, apple, etc., its larvæ being one of the "flat-headed" borers, so-called because the thoracic segments (next the head) are much wider than those that follow. It is sometimes quite abundant on old trees, and in May and June can be found ovipositing therein. Some entomologists consider that the beech was the original food-plant of the insect.

F 71.

Fig. 72.

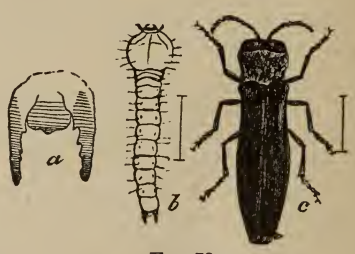

Fig. 73.

5. *Chrysobothris femorata*, Fab. This common borer of the apple tree (Fig. 72) has also been recorded (Riley, 7th Rept., p. 72) from beech, although of all the forest trees in this neighbourhood it seems to prefer the hickory. The oak, maple, mountain ash, linden and box elder are also said to be attacked by it. It is a flattened beetle, somewhat over half an inch long, of a metallic, bronzy colour with some greenish reflections, and the face of the male is bright green. It has been often mentioned in our Reports.

6. *Chrysobothris sexsignata*, Say. This beetle very closely resembles the preceding, but is slightly smaller, and is more rare with us. Mr. Chittenden records (Ent. Amer. V., p. 219) cutting a specimen from a beech tree. This beetle has also been found in yellow birch (Packard l. c., p. 485

7. *Agrilus bilineatus*, Web. This pretty little beetle is more elongated and in shape strongly resesembles the Red-necked Agrilus *(A. ruficollis)* (Fig. 73) which forms the gouty swellings on raspberry canes (Fig 74). It is about three-tenths of an inch long, and the upper surface is black, or greenish black, with a line of golden pubescence on each elytron, and on the margin of the thorax (these lines sometimes rubbed off or wanting); below the colour is coppery. I have taken it upon beech and believe it to infest this tree. Dr. Packard and Prof. Riley have each found it infesting oak.

Fig. 74.

8. *Agrilus interruptus*, Lec. This species much resembles the preceding, but is somewhat smaller and more slender. Its colour is more of a bronze, and instead of the line of pubescence it has a minute golden dot toward the tip of each elytron. I have found it upon beech, birch and hickory, but do not find in my books any records of the trees upon which other collectors have found it.

9. *Brachys æruginosa*, Gory. The larvæ of this little buprestid have been found by Mr. V. T. Chambers (Packard. l. c., p. 519) to mine in the leaves of the beech. The posterior segments are not so tapering as in the larvæ of the species previously mentioned. The beetle very closely resembles the following in size and appearance.

10. *Brachys aerosa*, Melsh. (*B. terminans*, Lap) is rather a common beetle with us, and is found most frequently upon the basswood, but also occurs upon elm, beech, etc, and may mine in the leaves of all these trees. It has been bred by Prof. Gillette from the leaves of poplar (Can. Ent., vol. xix., p. 138). The beetle is only about one-sixth of an inch long, of a sub-triangular or narrow shield-shaped figure; general colour coppery, the elytra purplish and ornamented with pubescence, which forms a band across the tips. We have a larger species, *B. ovata*, Web., which occurs upon oak.

Cleridæ.

11. *Thanoclerus sanguineus*, Say. This little beetle is sometimes abundant under the bark, and quickly attracts attention by its bright red colour. It is one-fifth of an inch long and quite narrow; the head and thorax a duller red than the elytra and legs. It is very active in its movements, and when disturbed quickly hides in a crevice or the burrow of some borer. It is rather beneficial than injurious to the trees upon which it occurs, as it preys upon other insects.

Ptinidæ.

12. *Eucrada humeralis*, Melsh. I have found this beetle under the bark of beech, and as most of the members of this family are destructive insects this may probably be classed as such. It is about one-fifth of an inch long, of brownish colour, with a reddish spot on each shoulder of the elytra which have several rows of punctures.

13. *Ptilinus ruficornis*, Say. This small cylindrical beetle which is very frequently found boring "pin-holes" in oak and maple, has also been found by me to do the same in old beech trees. The female is one-tenth of an inch long, brownish, with the head bent down under the globose thorax, the elytra faintly punctured. The male is only about half as large and is easily recognized by his prominent red antennæ (which give the species it name), the outer joints of which have long leaf-like projections.

LUCANIDÆ.


FIG. 75

14. *Platycerus quercus*, Web. This beetle and the two following belong to the stag-beetle family, in the males of which the mandibles, or jaws, are sometimes wonderfully developed. In this species they are as long as the head and turned up and irregularly toothed at the point (Fig. 75.) The beetle is about half an inch long, rather flattened, bronzy black in colour, shiny and feebly punctured. The female is lighter in colour, being nearly brown above; the legs and under surface reddish. The larvæ like those of the following species live in decaying wood of various trees.

15. *Platycerus depressus*. Lec. This species differs from the foregoing in being slightly larger, blacker and with the elytra more coarsely striate and punctured. The mandibles are shorter and stouter.

16. *Ceruchus piceus*, Web. This is a very common insect in old beech logs and stumps. It is much more stoutly built, and is very variable in size; from two-fifths to three-fifths of an inch long, the males being much larger than the females. The head is large, as wide as the thorax, and with a deep frontal depression. The jaws of the male are as long as the head, and with a strong inner tooth about the middle.

SCARABÆIDÆ.

17. *Dichelonycha elongata*, Fab.—A rather cylindrical beetle; four-tenths of an inch long; the general colour testaceous or yellowish; head flattened above; thorax more or less pubescent; wing covers with a greenish reflection, more pronounced in the males; under surface hoary, with scale-like hairs; tips of hinder legs sometimes blackish. This beetle and two or three closely allied species difficult to separate from it, feed in the perfect state, on a variety of trees. They much resemble in size and general appearance the Rose beetle, *Macrodactylus subspinosus*, Fab., which belongs to the same family but is, however, smaller and less corpulent. I have found them not infrequent on beech.


Fig. 76.

18. *Osmoderma scabra*, Beauv.—This is a large stout beetle (Fig. 76) of a dark bronze, or metallic brownish colour. Its length is nearly an inch, and it is about half as wide (across the elytra). The head is small, squarish and depressed above; the thorax rounded and irregularly punctured; the elytra irregularly wrinkled and striated. When alive this beetle diffuses a strong odour, which much resembles that given off by Russian leather. The larvæ feed in the decaying wood of old trees, and are fat white grubs much like those of the May-beetles. They construct large oblong cocoons from the particles of decayed wood, in which the grub pupates and finally becomes a beetle. It is probable that the closely allied species *O. eremicola*, Knoch., also breeds in old beech cavities.

SPONDYLIDÆ.

19. *Parandra brunnea*, Fab.—The shape of this beetle and its large mandibles give it a great resemblance to some members of the Lucanidæ (Stag-beetle family), but it is at once distinguished by having the antennæ straight and tapering to the tip, instead of terminating in a leafed club. It is variable in size, from five-tenths to eight-tenths of an inch in length, and of an almost uniform reddish or yellowish brown colour. The grubs live in the wood of stumps and old trunks of various trees, the beetles being found under the loose bark, although they are seldom numerous.

CERAMBYCIDÆ.

20. *Smodicum cucujiforme*, Say.—This beetle I have not seen, but it is one of the smaller species of the longicorns, being only three-tenths of an inch long. The following is part of the original description of the species: "Body depressed; head with a slight

rufous tinge, antennæ rather shorter than the body, tinged with rufous; thorax longer than broad, obtusely contracted each side, rather before the middle; elytra irregularly punctured, without elevated lines; thighs dilated." Mr. Schwarz records finding it under the bark of beech. (Packard l. c. p. 79).

21. *Dryobius sexfasciata*, Say.—Mr. C. G. Siewers records (Can. Ent. vol. XII., p. 139) finding five examples of this handsome beetle under the bark of beech. The grub is stated by Dr. Fitch to be much like that of the common elm-borer, *Saperda tridentata*, Oliv., but larger. The beetle is also of nearly similar form to that species, the length about three-quarters of an inch; colour black, and each elytron with four oblique yellow bands.

22. *Xylotrechus quadrimaculatus*, Hald.—This beetle much resembles in shape and colour a longicorn, *Neoclytus erythrocephalus*, Fab., which is often found on hickory. That species, however, is smaller, and has longer legs; the yellow markings are also different. *X. quadrimaculatus* is half an inch long, and of a reddish colour; head small; thorax globose with two bright yellow spots on front margin and less distinct markings on the hinder margin; elytra with somewhat yellowish tinge and faint oblique yellow lines; legs slender and pale reddish. The only specimen of this beetle which I have taken at Ottawa was found resting on the branch of a beech in June.

23. *Cyrtophorus verrucosus*, Oliv.—This is a common beetle, very ant like in appearance, which occurs upon various trees, and very frequently upon flowers, such as spiræa, goldenrods, etc. Mr. Chittenden has bred examples from beechwood. It varies considerably in size, but average examples are four-tenths of an inch in length. The head is small and sunken to the eyes in the thorax; the antennæ are nearly as long as the body and very slender, the third joint having a strong spine at the tip. Thorax rounded and humped above, very closely and finely sculptured. The elytra are angulated at the shoulders, and each has an elevation near the base, along which runs diagonally a narrow white line, behind which are two less oblique lines, the last being almost transverse. Sometimes the beetle is all black, with the exception of these white lines, and the partly reddish legs, but many specimens have the basal half of elytra (between the thorax and transverse white line) reddish, as also the corresponding under surface and the legs.

24. *Centrodera decolorata*, Harr.—This is a much larger longicorn of which I have taken one example on beech. It is about an inch long, of a chestnut red colour, except the elytra and abdomen, which have a more yellowish tinge. Head moderate in size, and narrowed behind the large, coarsely granulated eyes into a neck. Thorax small, narrowed in front and strongly angulated, or subspinose, in the middle. Elytra at base nearly twice as wide as thorax, and tapering very little toward the rounded tips; coarsely punctured at base, and more finely toward tips, Antennæ reaching to middle of elytra, dusky except basal joint. Legs moderately long and stout.

25. *Toxotus Schaumii*, Lec.—A very handsome longicorn of which one of my examples was taken on a small beech, in a beech grove, in July. It much resembles in size and shape the preceding species, but the thorax is less strongly angulated, and the elytra taper more. With the exception of a wide red band on all the thighs it is entirely black.

26. *Anthophilax attenuatus*, Hald.—One example of this rare longicorn was taken by me in an old beech log in May. It is in general shape much like the foregoing and about three-quarters of an inch long. Head and thorax black; antennæ and legs slender and reddish; elytra brownish and mottled with whitish pubescence.

27. *Leptura subhamata*, Rand.—An example of this pretty and variable species was also taken in an old beech log, and I have taken it likewise on oak. It averages about half an inch in length, and is of rather slender build. The head is small and narrowed to a neck; antennæ long and slender, the joints partly yellow at base. In the male the thorax is black, but in the female it may be either black with a yellowish side stripe, or yellowish with a black central stripe. The elytra of the male are black, with a yellow

stripe on each reaching from the shoulder to beyond the middle, and crossed by a black band so as to form a cross. In the female they may have the same pattern, only the yellowish stripes are larger, or the elytra may be yellowish with a narrow black rim and a band across the middle. Under surface of male, and most of legs, black; under surface of female and legs mostly yellowish.

28. *Goes pulverulentus*, Hald.—This beetle has been recorded by Dr. Horn as very destructive to living beech trees, in the larger branches of which it bores tunnels several inches in length. It may, therefore, be considered one of the most injurious insects infesting this tree, and, as I have previously recorded (Ann. Rept., xiv p. 48), there is little doubt that it also inhabits the hickory. It is a rather large beetle, and in shape closely resembling the female of the common pine-borer, *Monohammus confusor*, Kirby, the smaller specimens of which it equals in size. Length from three-quarters of an inch to about an inch; antennæ slender and slightly longer than body; thorax cylindrical, with a sharp spine on each side; elytra wider than thorax; legs moderately long and stout; colour brownish, but having a hoary appearance, especially beneath, from short white pubescence.

29. *Acanthoderes quadrigibbus*. Say.—This species has been recorded by Mr. Schwarz as boring in the dry twigs of beech and oak. It is a pretty little beetle, quite different in shape from the preceding. Its length is about three-fifths of an inch, and it is rather broad and flattened in proportion to its length; thorax tuberculate above; legs short; the thighs rather stout; elytra with mottled whitish and brownish pubescence and with a sinuate whitish band before the middle.

30. *Leptostylus macula*, Say.—This species which infests the butternut and chestnut has also been observed by Mr. Chittenden to inhabit the beech. I have found it upon butternut, maple and balm-of-gilead, but more frequently upon hickory. It does not differ very greatly in appearance from the preceding beetle, but is smaller and less tuberculate. Individuals vary in length from one-fifth to three-eights of an inch, colour brownish; thorax with a white stripe on each side, bordered above by an interrupted brown line; legs banded with white and brown; elytra coarsely punctured and imaculate with brown spots, and banded with white behind the middle; antennæ long and slender.

31. *Hoplosia nubila*, Lec.—This species, according to Mr. Schwarz, also bores in the twigs of beech. It is longer and narrower than the preceding insect. Length three-eights to one-half of an inch; thorax with lateral spines; antennæ longer than body and slender; elytra longer and almost parallel sided, truncate at tips instead of rounded: colour brown, with mottling of whitish pubescence, giving a spotted appearance, and leaving irregular bands on the elytra.

Rhipiphoridæ.

32. *Pelecotoma flavipes*, Melsh.—A small, slender beetle which on one occasion I found quite abundantly on an old beech tree. As the members of this family are parasitic in their habits, it may probably be considered as a beneficial species, preying perhaps, upon some of the inhabitants of the tree.

Otiorhynchidæ.

33. *Pandeletegus hilaris*, Hbst.—This beetle belongs to a family of weevils, or snout-beetles, which contains some well-known injurious insects. Harris records it as boring in oak, and occurring on all trees from May to September; while Mr. Chittenden notes it as common upon the beech. I have not found it at Ottawa yet, but have received specimens from Mr. Johnston, of Hamilton. It is quite small, being only from one-eighth to one-fifth of an inch long; colour pale-brown, with some greyish and black stripes; beak short and broad; thorax coarsely granulose; elytra with rows of deep punctures.

CURCULIONIDÆ.

34. *Ithycerus noveboracensis*, Forst —This species is the largest representative of the family which occurs with us. It has been found at times a serious pest in orchards, injuring apple, peach, pear, plum and cherry (see Insects Injurious to Fruits, Saunders, p. 196.) According to Riley it infests the oak, in the twigs of which the larva tunnels. With us it seems to inhabit the beech, upon which I have frequently taken it, in the month of June. At Chelsea, a few miles from this city, it was very abundant one season, individuals being observed on every tree examined in a grove of beech. It may be readily recognized among our snout-beetles by it greater size, being five-eighths of an inch long, and robust. Beak, broad and stout with a ridge down the centre; thorax cylindrical, a little narrowed in front; elytra twice as wide as thorax, and declivous or pinched in at the apex to fit the corpulent body; colour greyish; the thorax with three indistinct pale stripes, and each elytron also with three whitish lines, interrupted with black spots, lower surface and legs whitish. Fig. 77.

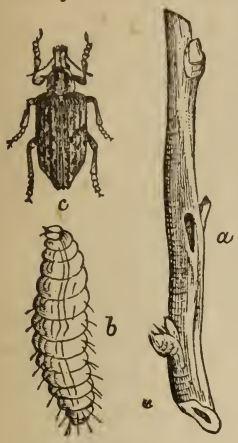

Fig. 77.

35. *Cryptorhynchus bisignatus*, Say.—A pretty little brownish weevil, with an oblique white dash on each elytron, much resembling in shape the Plum Curculio but smaller and not tuberculated. Mr. Chittenden has found it upon both oak and beech trees and believes that it lives under the bark of these trees.

36. *Acoptus suturalis*, Lec.—Mr. Chittenden has taken specimens of this beetle from beech wood. It has been recorded by me (Ann. Rept. xiv., p. 50) as boring in hickory, and the following description was there given of it. A small, black beetle (length one-eighth of an inch), densely clothed beneath and more sparsely above with short yellowish hairs. The elytra are striated and in unrubbed specimens have a wide band of yellowish pubescence across the base, and a narrow one near the tips, which are black, as is also the space between the bands; a white line along the suture interrupts the basal band.

CALANDRIDÆ.

37. *Phlœophagus apionoides*, Horn.—This is a very small and narrow blackish weevil about an eighth of an inch long, with punctured thorax and striated elytra, which Mr. Chittenden found to occur upon the beech with the species just mentioned, and which he believes to breed in the wood likewise.

36. *Phlœophagus minor*, Horn —As its name indicates this species is smaller than the preceding, but otherwise closely resembles it, except in being of a paler colour, a reddish brown. Mr. Chittenden states that it breeds in the beech and also occurs on the elm.

38. *Stenoscelis brevis*.—This species which is stated to breed in the wood of beech has been found by me also infesting oak, hickory, maple and poplar. It is a black cylindrical beetle, one-eighth of an inch long, with faintly punctured thorax and striated elytra; beak short and smooth, giving it much the appearance of some of the bark-borers which belong to the next family.

SCOLITIDÆ.

39. *Monarthrum fasciatum*, Say. This little species bores in the living tree in the same manner as the Apple Bark-borer (*M. mali*, Fitch) which infests the apple, and which it much resembles.

40. *Xyleborus obesus*, Lec.—This is also a small insect which bores in the living tree, and which much resembles a destructive species (*X. pyri*, Peck) which attacks the pear and which has been named the Pear Blight Beetle.

NOTES ON THE SEASON OF 1896.

By J. Alston Moffat, London, Ontario.

The season commenced early and gave promise of being a good one for the collector, but soon showed symptoms of failing to fulfil its promise. The conditions here were unusually favorable for the production of luxuriant vegetation, and might have been considered equally so for the maturing of insect life, and yet the season was marked by a noticeable absence of that profusion usually seen in the early part of the summer particularly. And this seemed to be the experience of all the regular collectors I met with. When asked as to their success, the unvarying reply was, "There is nothing to be got." And yet, on the other hand, Mr. Bryce, an electric light trimmer, made during the season a large and varied collection of moths; not damaged ones taken out of lamps, but fresh specimens in good order, taken mostly at rest in the vicinity of the lights. When looking at that collection one felt like saying that there could have been no scarcity of good material, but it only proved the value of electric light as a means of concentrating them at particular places for observation, and also, that insects have to be somewhat abundant to become conspicuous. The only moths that attracted my attention about the lights were species of *Crambidæ*.

The climatic conditions in the southern portion of Ontario were remarkably diverse within short distances, the western section having a superabundance of moisture, whilst the eastern section was proportionately dry, vegetation of all kinds there suffering severely from want of rain; yet there were two injurious insects that seemed to prosper equally well under either condition, namely, the Colorado potato beetle and the imported cabbage butterfly, both being unusually plentiful.

The newspapers reported grasshoppers as causing considerable damage in specified localities, but within the range of personal observation, they were noticeable mostly for their absence. Even in the dryest localities visited by me they could not be called abundant.

As was to be expected, after such a superabundant overflow of *Hadena arctica* last season, the next would be one of corresponding scarcity of the same species, and so it proved to be. Three specimens of it came under my observation, and three only. Many writers have a fondness for giving columns of figures that are perfectly appalling, illustrative of the natural cumulative increase of insects in a given number of generations, and the unsuspecting reader taking that as the unvarying rule in nature, reasonably concludes that if any species is particularly plentiful one season, it must necessarily be much more so in the following one, and consequently anticipates its advent with more or less alarm; but nature, which is full of surprises, has an easy method of confusing arithmetical calculations, or even of running counter to them. Long continued observation has led to the conclusion that the rule in nature is rather that an unusual outbreak of an insect in one year will be followed by a more than usual scarcity of the same species the next.

Two things are necessary for an abundance of any insect form. First, plenty of eggs; second, favorable conditions for the maturing of the same, in which must be placed an absence of living foes. A noticeable outbreak of a destructive insect is not necessarily preceded by an unusual number of producers. If all the eggs of any species of insect in any year were to come to maturity, there would undoubtedly be a noticeable increase of that species. But as a rule, it is a very small percentage of the ova of any insect that reaches maturity, many natural causes combining to reduce their numbers all along the line of their advance towards that consummation, and thus the balance is maintained between contending interests. This is what is known in scientific phraseology as "the struggle for existence," a delightfully brief but vague expression that covers much ground but explains nothing.

It would be a great satisfaction to be able to give a direct answer to the question so frequently put as to the cause of the abundance or scarcity of some insects at particular

times, but with creatures that work so much in secret as insects do, it is probable that it can never be done. When an unusual outbreak of any injurious insect occurs we can say positively that the conditions for its coming to maturity had been particularly favorable, but that includes all the climatic conditions, whether these were wet or dry, cold or hot, steady or fluctuating, and as these influence different species in different ways, the uncertainty is the greater; then there is food supply in the past as well as the present; the absence of predacious enemies, parasitic fungi and such like; they may also cover the character of the cultivation of that locality, as that may form a harbor and encouragement to the increase of pests,—an extent of varied knowledge which no one is likely to be in a position to possess. And so with their absence or great scarcity in other years, we can say positively that the conditions were not favorable, but just what these were it may be impossible to specify, especially by one who was not in the locality and had no opportunity of observing the conditions.

The first really serious and wide-spread outbreak of the army-worm, *Leucania unipuncta*, Haworth, in Canada, having occurred the last season, was the means of directing general attention to that destructive insect; and was productive of much newspaper correspondence. I had an opportunity of seeing the worm in the flesh, for the first time to my knowledge, and inspecting its work; and this is how it was obtained:

Being on a visit to Hamilton in July, I was invited to spend the evening of the 22nd, at Boulderwood, the charming summer residence of Mr. and Mrs. B. E. Charlton. It is situated on the brow of the mountain, adjoining the north or city side of the asylum grounds. On our way up, Mr. Charlton informed me that the army worm had invaded the asylum grounds, and was destroying the crops; and he proposed that after dinner we should visit the locality, and survey the invading army; which we accordingly did. We obtained the guidance of the farmer of the grounds, who led us to the infested field, which was at the extreme southern end of the asylum farm. He said they were first noticed in a field of oats, and on the other, or southern side of the road from his, and that the owner as soon as he knew they were there, cut his oats and shocked them in the field. The next day when he examined his shocks he found the ground under them a mass of worms mingled with oats. The asylum farmer at once ordered his to be cut, but had them carted to a far distant field and there put up in shocks.

The crop next north of the oats that had been cut and removed, was spring wheat. There we had evidence of what the worms could do. Not a loose leaf was to be seen in the field; the straw standing quite naked. It had begun to ripen, which probably had saved it and the heads from attack, as some of the short and greener ones showed signs of having been nibbled at. We found a number of the worms under clods, but the farmer expressed surprise at their being so scarce, as compared with the previous day, when a pint or more of them had been taken in a very short time, which had been wanted for exhibition purposes. Probably the bulk of them had gone to seek fresh pasture, as there was not a green leaf in that field left for them to eat. Some of those taken seemed to be full grown, and may have been preparing to pupate, as chrysalids were found. During the search Mr. Charlton found a creature which was to us of doubtful parentage. I thought I recognized it as something I ought to know, but could not say what at the time. Having surveyed the situation to our satisfaction; and Mr. Charlton having secured three of the largest worms in a box, the unnameable creature and a chrysalid; we returned to his residence. After these had been looked at by the residents and visitors assembled, the time came when I had to leave; Mr. Charlton kindly said I might take the box and its contents, which I was very pleased to do; so I put it in my vest pocket, which it just fitted. Upon reaching my place of abode, I took out the box to show my friends the army worms; when I opened it, I found the largest one had disappeared, except the head and shrivelled skin, which was about the size of a grain of wheat, whilst the unnameable creature had another one by the middle, and was quietly engaged in absorbing its internal economy with unmistakable satisfaction. This disclosure of its habits at once suggested to me that it was the larva of some predaceous beetle, probably an *Harpalus*, and that I had seen an illustration of it somewhere. Upon

returning to London and making search, I found its exact counterpart on an enlarged scale in "Saunders's Insects Injurious to Fruit," page 185, which is here reproduced, Fig. 78.

During the next day, the *Harpalus* larva rested quietly, two worms seemingly being enough to satisfy its cravings for one day; whilst the remaining worm was very restless, no doubt from want of food. In the evening, being in company the army worm was introduced in the conversation, when I remembered that I had the box in my pocket, I took it out to show the worm, but there was not the vestige of a worm left, and the *Harpalus* larva was rushing frantically round in the box in search of more. I kept it that night to see if it would attack the chrysalid, but it did not, so I gave it its liberty next morning in consideration of the good it might do.

Fig. 78.

A great deal of romance has been written upon the army worm. Its sudden appearance in vast and destructive hordes is well calculated to arouse the imagination of those who are usually totally indifferent to, and wholly ignorant of the habits of insects; consequently the movements of the army are to them perfectly mysterious. We read of their coming, no one knows how, or from where, of their always travelling to one particular point of the compass. Of their following a leader who directs their movements; and who gives the signal for their advance by a wag of his head; and much more of the same sort. The army worms come from eggs, like all other insects, which in this case are laid near the roots of grasses by the moth *Leucania unipuncta*; and may be feeding there in great numbers when young, without attracting the slightest attention. It is not until they are well grown that they acquire their great powers of destruction, and then the field in which they were born may not be able to sustain all of them; when the necessity to travel to other localities in search of food is forced upon them. The only really mysterious thing about their movements is, that they should keep together in a body, and go in the same direction in search of food, instead of, as is usual with caterpillars, each going in the direction that its fancy leads, independently of the others of its kind. This gregarious habit is indeed very wonderful. But food is their objective point of travel, not any particular one of the compass.

There is another destructive insect that is endowed with this peculiar habit of travelling all together in one direction in search of food, namely, the migratory locust in its mature state; and a consideration of its mode of progress in desolating a region, may assist us in forming an idea concerning that of the army worm. When we read of an invasion of locusts into a locality where there were none before, they are always represented to us as coming down from the air above, ravenously hungry, as if it had been their first stopping place for food on a long journey, a few at first, then a dense mass, sufficient at times to obscure the light of the sun, gradually becoming thinner, then passing over, not leaving any living green thing behind them. This appearance, although it may be misunderstood by the onlooker, is nevertheless quite in harmony with the actual facts of their progression. Supposing a field well stocked with locusts who have just developed mature wings and a prodigious appetite, find their food supply exhausted, and it has become needful for them to go elsewhere for more. The field next to them is untouched, those close to it enter, those behind them follow, whilst those at a distance who are as eager for food and in as great a hurry to obtain it, rise on the wing and fly over the feeders and alight just beyond them, their peculiar gregarious instinct compelling them to feed in crowds, so that those that entered the fresh field first, find themselves surrounded by a multitude which has devoured everything before they get enough; hence they in turn find it necessary to rise on the wing and make for the front again to obtain more and so having started they proceed; and the deeper and denser the advancing host, the further they have to fly to reach the front, and the more of them there are on the wing at one time, the higher some of them have to rise in the air to get over the others; and when we read of their coming down in such numbers and such

force, as to remind the beholder of a hailstorm, and make him glad to seek shelter from their contact, it is in perfect accord with their mode of progress and their eager haste to obtain food; and this mass, to a beholder who could take it all in at once, would appear like a huge rolling crowd of living particles, descending in front but ascending at the rear, whilst the impelling force that keeps it going is the necessity for something to eat. And when we consider the meagreness of the supply in some localities, compared with the enormousness of the demand that always exists, we get the reason for the differences of time that they take on the way. If food is abundant, they linger; if it is scarce they pass rapidly on. When we turn our attention again to the army worm, we see that the principle and the motive are the same in both; but the one proceeds on the wing, through the air, whilst the other has to keep on the ground and go afoot; yet the front ranks will be constantly changing places with the rear, for as those in front stay to eat, those behind have to pass beyond them to obtain a share; and as the feeders are so numerous in one place, none of them get all they want, so they are compelled to move on to get some more; which completely disposes of the "leadership" theory.

Amongst the captures here of rare forms during the past season, I may mention a specimen of *Papilio Marcellus* by one person, and one of *P. Philenor* by another. *P. Cresphontes* again paid us a visit, after an absence of two years. It appears as if this southern butterfly must be either periodical in its habits, or has not yet succeeded in firmly establishing itself in more northerly localities; and is depending upon additional migrations to maintain an appearance. In the year 1893 it was more abundant, and reported from a greater number of localities, and some of these further north than ever before. In 1894 I saw a few in the early part of the season, but none later on. In 1895 I did not see a single specimen on the wing, nor was there one reported to me as having been seen. In the latter part of August, 1896, I saw a fine fresh specimen, but did not secure it, I also saw one that was taken later in the season in a damaged condition; which would seem to give promise of its being more plentiful again next year.

A specimen of *Erebus odora* was taken by Mr. Kyle, at Dundas.

The things new to this locality; recognized in Mr. Bryce's collection, were the true Carolina Sphinx, as distinguished from *quinquemaculata*. Large in size, dark in colour, and in fine condition. *Cisthene unifascia*, Grote, bright and fresh. Mr. Bryce has kindly donated a specimen of each to the Society's collection. He has also taken a single specimen of *Aspila virescens*, Hub. Also many choice varieties of less rare things, as well as several species not yet determined. Never did I see the webs of *Hyphantria cunea*, the fall web worm, so offensively obtrusive as during the past season.

In the early part of October the males of *Hybernia tiliaria*, Fig. 79, the Lime-tree Winter Moth, were in great profusion around the city. They could be seen even on frosty nights, fluttering about the lighted shop windows, and in daytime resting in sheltered places, or being driven along the street by the wind; their large sail-like wings affording ample space for catching every breeze, and being carried helplessly away by it. There was a wonderful, and particularly interesting diversity in the shade and pattern of the colour and ornamentation of their wings, which their abundance gave one a good opportunity to observe. The females I did not see; as these are wingless they would require to be sought for upon the trees.

Fig. 79.

WARNING COLORS, PROTECTIVE MIMICRY AND PROTECTIVE COLORATION.*

By F. M. Webster, Wooster, Ohio.

In "Memoires de la Societe Zoologique de France," Professor Felix Plateau has recently given the results of some experiments carried on by himself, to determine whether, as has often been stated, the Magpie moth is really an example of what is termed "warning color." In order to solve the problem, the Professor ate several of the caterpillars, and found them to possess something of the flavor of almonds, and not unpleasant to him, but rather the reverse. Unfortunately, this experiment only proves that as against a person to whom the flavor of almonds is not distasteful, the larvæ of the Magpie moth are not warningly colored, but the real question regarding protective coloration, as against bird enemies, does not appear to be nearer a solution than it was before. Men do not feed upon the larvæ of this moth, or the moth itself, nor have we good reasons to suspect that they have ever done so, and there is no reason why these caterpillars should be, to them, distasteful, as no material protection would in any case result. The two following incidents will illustrate my point.

Species belonging to the genus Danais are, rarely, if ever, to any extent attacked by birds, and in the tropics even monkeys are said to reject them. In the United States, *Danais archippus*, (see Fig. 27, page 31), is mimicked by *Limenitis disippus*, (Fig. 80), and in other parts of the world other species of the former genus are mimicked by still other species of butterflies, some very interesting illustrations being given by Mr. Roland Trimen in his paper on "Some Remarkable Mimetic Analogies among South African Butterflies"† In the United States, *D. archippus* breeds in the north, and in autumn migrates in immense swarms to the south, where it hibernates through the winter. In "Insect Life," it is stated‡ that these butterflies are sometimes attacked in their winter quarters, and great numbers of them eaten, by a mouse belonging to the genus *Onychomys*; one of the grasshopper and scorpion mice. On an island in Aransas Bay, on the gulf coast of Texas, the remains of at least twenty-seven individuals were found in one place by Mr. Attwater, thus showing that the species is not distasteful to this mouse, but by no mean disproving that to other animals, and to birds, it is distasteful, and for this reason mimicked by other species of butterflies. This mouse is not a persistent and perpetual enemy, and unrestrained does not threaten the extermination of the species, and protection from it has never become necessary, and is not now essential. The Harlequin cabbage bug, *Murgantia histrionica*, (Fig. 81), is a conspicuously colored, tropical species, that has made its way northward as far as Lat. 40° 48′, even the egg being white banded with black. Not only does the species feed during its entire life, in all stages of development, in the most exposed positions, but the eggs are placed in clusters equally exposed, every habit, in fact, indicating a total disregard of the presence of natural enemies of any description, thereby implying, though not proving that it is distasteful if not warningly colored. Some time since I had

Fig. 80.

Fig. 81.

*Read before Section F, Zoology, of the American Association for the Advancement of Science, at the Buffalo, N.Y., meeting, August 25th, 1896.

†Linn. Soc. Trans. Vol. XXVI., pp. 497, *et seq.*

‡Vol. V., p. 270.

occasion to confine a number of these bugs in a greenhouse upon cabbage plants over which a breeding cage without a bottom was placed, earth being banked up about the base of the cage. The bugs had been thus confined for a short time when during the night, mice worked their way under the side of the cage, and in the morning all that remained of the bugs consisted of a confused lot of heads, legs and fore wings, the mice having clearly eaten the confined bugs during a single night. Still, as against persistent and continual enemies these bugs may be and probably are distasteful, mice being only occasional or accidental enemies.

In commenting on the experiments of Professor Plateau, "Science Gossip," perhaps somewhat overestimating the value of the results obtained, says :— "It would indeed be well if all the examples of 'warning coloration' were subjected to as careful an examination. Equally cautious also should naturalists be before accepting examples of 'mimicry' among animals and plants In some cases the so-called 'advantageous mimicry' falls to the ground, for the insect which is supposed to imitate one of its fellows appears at quite a different time of year from it."

Now, caution is a grand virtue, and should be, always, the investigators watchword, but to be over cautious is to cheat ourselves and each other out of the truth, which practically amounts to little less than carelessness. He who cautiously winnows the grain, will be as careful that none is blown over with the chaff as he will be to keep the latter from falling back into the cleaned grain, as, in either case, his work will be but poorly done.

By the way, has it ever been settled, beyond question, that both the species protected and the one protecting must occur, interspersed together, over the same area, and at the same time of year? Would either the ornithologist or entomologist be greatly upset if he were to find that birds which had learned, by experience, in spring and while yet very young, to shun insects of certain peculiarities of colour and movement, or which appear to them to possess such characteristics, should continue to follow the same course in late summer or autumn? How soon do birds forget past experiences, and cease to profit by them? After having learned that certain insects, having certain peculiarities of color or of action are not fitted for food, will they not rather continue to profit by such experience, and avoid such at whatever time of year and wherever they encountered them? Besides, does all of this education have to be acquired by experience, or does heredity not exert an influence more or less important?

The adult of the Hickory tree-borer, *Cyllene pictus*, develops chiefly in *Carya*, and emerges in spring, being almost exactly reproduced, so far as form and colour are concerned, in the Locust tree-borer, *Cyllene robiniæ*, which develops in *Robinia pseudacacia*, and emerges in late summer. Both of these species are supposed to mimic wasps, but we will suppose that both wasps and borer have disappeared before the latter species of borer has emerged; would it not gain some protection from its close resemblence to the borer that had preceded it, several months earlier? Would entomologists be very much astounded if such conditions should be found to obtain among other species?

Adults of our *Podosesia syringæ*, resemble, very closely, both of our common species of Polistes, *P. annularis* and *P. metricus*, especially on the wing, and when at rest the abdomen of the moth is bent downward posteriorly and kept in constant motion, precisely as with the Polistes. If the moth is on the ground it does not readily take flight, or, like many other moths remain quiet, but moves about in precisely the same manner as the wasps. In this case a defenceless moth is not only, in all probability, protectively colored, thereby resembling an entirely different insect, armed with a formidable weapon of defence, but its movements are equally like those of the armed species, so that it must gain protection thereby, to greater or less degree. But if one were to hunt for *Polistes*, he would hardly select for his collecting ground a lilac bush long since out of bloom. He would be far more likely to search for them on flowers, where he would seldom if ever find *Podosesia*

Do we not here have grounds for doubting the necessity for the mimicking and mimicked forms occurring together over the same area, and if so, how far may they not

be separated, and the former gain more or less protection from its enemies? Is it not more probable that birds and other natural enemies will avoid species having a close resemblance to armed or distasteful species, during their entire life, and wherever they may go? Will not birds that have hatched and reached maturity in the north, and there learned to avoid armed or inedible species of insects, or such as closely resemble them continue to follow the same policy respecting the latter, after they have migrated far to the southward, and may not the recollections of *Polistes annularis* offer protection to species resembling it, like the *Podosesia syringæ*, for instance, far beyond the geographical distribution of the former species itself? Unless birds are continually forgetting and having to relearn past lessons, we must certainly admit that protective mimicry and protective coloration may be in effect, over the entire area of distribution of the species deceived, even though this extend far beyond the area occupied by either the mimicking or mimicked species, though, as a matter of course, this influence must decrease as the deceived species are displaced by those new and untried. It would certainly seem that we might here find a solution of some of the very many perplexing problems of form, movements and coloration, that are constantly confronting the student of animal life.

That at least birds and animals do not readily forget old habits and former experience, especially if the lesson has been emphasized by pain, I will give two illustrations, one borrowed, the other my own, and doubtless many others will readily occur to anyone who will take the trouble to recall them.

In his exceptionally valuable work, "The Naturalist in La Plata," all the more valuable because of the author studying life in living forms, and speaking only of what he observed, Mr. W. H. Hudson, informs us that in that treeless country some species of woodpeckers have, through necessity, acquired the habit of seeking their food on the ground, and even nesting in the banks of streams, yet where this change of enviroment and consequent alterations in their way of living, have, in some cases, resulted in structural modifications, thereby showing their antiquity, they still retain their primitive habit of clinging, vertically, to the trunks of trees (presumably introduced) though the habit has long since lost its use. We thus have evidence, not only of the permanency of established food habits, but that habits of this sort are transmitted through long periods of time through the influence of heredity.

Years ago, when sparsely settled and therefore in a nearly primitive condition, the prairies of Illinois, where the greater part of my childhood was passed, were inha snakes of various species. My father owned a pair of oxen, one of which had, when a calf, been bitten by a snake; an experience that he never forgot. So long as he was retained on the farm, he could seemingly not only detect the presence of these reptiles by sight, but if out of sight and near at hand he appeared to scent them as unerringly; and once he detected the presence of a snake, of any kind or dimensions, he would give a snort and with a deep bellow break for home, whether attached to plow, harrow or waggon. On one occasion, with my father, I was crossing a track of prairie in early spring. The dry grass of the previous year had been burned and the ashes had disappeared, leaving the surface bare and brown, as the young grass had not yet put forth. I, at the time a very small lad, was in the waggon, while my father walked along beside the oxen. Suddenly "Old Star" gave a snort, and with a bellow that seemed to frighten his mate also, started off on a mad run, taking a bee line for home, not stopping until their stable had been reached. After assuring himself of my safety, my father returned to the place where the oxen had started on their wild run, and near by found a group of snakes that he had not before observed, belonging to a harmless species, collected in a confused mass, as is their habit at this season, enjoying the warm rays of the early spring sun. It does not seem probable that the sting of an insect would have a less lasting effect on a smaller animal or bird, or the recollections of a particularly distasteful morsel in the mouth soon become extinct, and besides, my father's ox would probably not have acted differently, or any sooner forgotten the pain of the snake bite received on the prairies of Illinois, had he been transferred to New England or California.

Along the south shore of Lake Erie I find two species of Hemiptera,* *Salda ligata*, Say, and *S. interstitialis*, Say, the latter and smaller, when skipping nimbly about, as Mr. Say stated that it did on the shores of the Missouri River, have a deceptive resemblance to so many stranded *Hydrophorus*, which I believe prefers such places to sandy beaches; and along Lake Erie at least they are far outnumbered by this species of *Salda*, which so closely resembles them. *Salda ligata* is larger and does not resemble any of the aquatic beetles found along the lake, but simulates to a remarkable degree some of the species of *Bembidium*, though at the time of my observation it was impossible to find a single representative of this genus in that immediate locality, whereas, they were most surely to have been found along the shores of almost any stream. Now, these two species of Hemiptera not only closely resemble species of beetles not present, but inhabiting quite similar places elsewhere, but also the movements of one species of Hemiptera add much more to this deception than does its color, thus raising the question as to whether these peculiarities of color and movement are mere coincidences, and of no service to the possessors, or whether they do receive benefit from such simulations by taking advantage of the lessons learned by the sand piper, or other birds of similar habits, along the shores of some distant inland stream, and which lessons caused them to shun insects having these peculiarities of form, movement and color. Is the investigator justified in casting aside the whole problem, because he does not happen to look far enough to see all of the factors entering into it?

On the extreme tips of the new growth of pine, a tree not indigenous in the locality where these observations were made, I find during June and July, a *Capsid, Pilophorus amœnus*,† which while at rest has much the appearance of some species of the Coleopterous family, *Cerambycidæ*, no species, however, being at all common on this tree, in this locality, though *Euderces pini*, is said to occur elsewhere on the pine. While moving about among the pine needles, however, the Pilophorus has almost exactly the quick, active, erratic movements of ants which frequent the same situations in considerable numbers, the Capsid, except when at rest, being almost indistinguishable from them. If all of this deception was for the purpose of misleading the ants, it would seem as though it would have been carried further, and obtained while the Capsid was at rest. The tips of these pine twigs are practically inaccessible to even the smaller arboreal birds, and against these protection is here unnecessary, while except an occasional spider, invertbrate enemies are equally wanting. In fact, so far as the need for protection in this particular situation is concerned, the whole matter of protective mimicry would fall to the ground, as no protection appears necessary, yet, it seems to me, that the careful investigator would not be justified in dismissing the whole matter as a mere coincidence, but rather in searching elsewhere for the causes of a phenomenon of which the effects only are here perceivable. The polished surface of the abdomen of an ant reflects the rays of light in such a manner as to appear like a narrow band of white, of which the transverse white fascia on the wing covers of *Pilophorus amœnus*, when that insect is in motion, appears almost the exact counterpart. I have never observed *Euderces pini* in life, but it does not seem impossible that it too may move about in a similar way, and both together mimic the ant where protection is necessary, my observations being made where but two of the three actors are present, and no protection necessary.

Another diminutive Capsid, *Halticus bractatus*,‡ is found in Ohio, and among other plants affects Red Clover, *Trifolium pratense*, feeding in all stages upon the upper side of the leaves. The effect upon the plant is to discolor the leaves, but this really affords protection to the young, as the changed color more nearly harmonizes with that of their bodies. The adults are black with antennæ and legs, except the femora, yellow, the femora being also black, both sexes being saltatorial. The male has the normal form of an Hemipter, but the female differs entirely in appearance, and simulates to a remarkable

*Kindly determined for me at the Department of Agriculture.

†Kindly determined by Professor Herbert Osborn.

‡ Also determined by Prof. Osborn, who, with my assistant Mr. C. W. Mally, found the species quite abundant in Iowa, the latter gentleman observing it also in Northern Ohio.

degree, a beetle, *Chætocnema parcepunctata*, also very common on clover and other plants. Curiously enough, where I find the former in greatest abundance, there are almost none at all of the beetles, while in a clover field not over one-fourth of a mile away, the beetles are very abundant and none at all of *Halticus bractatus*. That we have here a well defined case of simulation can hardly be doubted, yet the simulating form and the form simulated avoid each others company as if mortal enemies, there being no other forms present that at all resemble them.

I have made no experiments with any of these insects in order to determine whether or not they are distasteful, for the reason that any results obtained with the facilities at hand would have added to instead of reducing the complication. I might, like Professor Plateau, have eaten some of these insects, and learned whether or not they were distasteful to me, or I might have fed them to domestic fowls, or wild birds in confinement, but failed entirely of securing the data required. It seems to me that the only testimony in these matters, worthy of consideration, is to be found in the stomachs of insectivorous birds, and other vertebrate enemies if any, shot while feeding in the exact locality and under perfectly free and natural conditions. Giving a bird perfect freedom and allowing it to make its own selections and discoveries is one thing, while confining it, and doing these things for it, is quite another. It is what these natural enemies actually do, under perfectly natural conditions, that we must learn, and not what they can be induced to do.*

Over a large portion of the United States, and to a less extent in Canada, primitive conditions no longer obtain, while modern conditions are undergoing a constant change, the plow and axe of the husbandman having exterminated many forms, both vertebrate and invertebrate, if not entirely, over large tracts of country, and we may and probably do have cases of peculiar coloration and movements that were once protective, but now remain only as vestiges of a former state of affairs, the forces that brought them into existence no longer existing, except locally.

One phase in the radical changing of the natural flora and fauna over areas of greater or less extent, whereby both plants and insects are entirely displaced by others, emphatically different, is shown by the two accompanying illustrations, showing the bed of a small lake just prior to and after being brought under cultivation, and an aquatic insect fauna displayed by another, terrestrial, and more or less connected with the introduced flora. (See plate preceding, page 65).

In Northern Illinois a species of willow, *Salix discolor*, the leaves of which are nearly white on the under side, grows in wet places, on hummocks, and to the height of from one to six feet, forming a regular compact cluster. The foliage is fed upon by a hard, heavy bodied beetle, an inch or more in length, and often nearly a half inch across the shoulders, in color ebony black with white pubescence, which on the elytra is arranged in irregular transverse fasciæ, with more or less parallel markings, all of which combine to give the insect the appearance of a white surface, irregularly tessellated with black. This beetle, *Plectrodera scalator*, fig 82 feeds by eating holes in the leaves, or irregular notches, leaving the mid and lateral veins, with irregular borders of the leaf along these nearly intact. The beetle remains on the under side of the leaf, the eaten portions of which, against the background formed by the interior of the thicket, appear black, while the uneaten portions appear nearly white. In this way a beetle stationed on an uneaten leaf has almost the exact appearance of a leaf partly eaten, and so perfect is the deception that a fairly good collector may pass some years in a locality where the species is very common, without seeing a single specimen, until he detects the deception. Aside from its considerable dimensions and hard body, this beetle is armed with a rather formidable spine on each side of the thorax, thus rendering it rather an undesirable sort of prey for any of the smaller birds, and altogether too much so for any invertebrate enemies. In

Fig 82.

* I may be permitted to state that, in Ohio, birds cannot be shot for the purpose of making scientific investigations, without running the risk of being arrested and heavily fined therefor.

the locality in Illinois, where I studied this species, only two vertebrate enemies can be said to exist, one the Shunk, *Mephitis mephitica*, and an occasional entomologist, neither of which are at present abundant. Does it appear likely that all of this is brought about by mere accident, or is it not far more probable that protection was once gained, and elsewhere the deception may continue to give protection?

There are still other points in this problem that seem well worthy of careful consideration. We hear the terms, warning colors, protective mimicry and protective coloration, etc., used, as a rule, in the sense of a finality. Just as though these particular workshops of nature had finished their mission, and were now closed indefinitely; and while we have ample supplies of the finished product, there is none at all in process of construction. Have we here no transition stages? We are dealing with some of the forces that go to make what we term evolution, a process going on, as is believed, continually and everywhere about us, and if this is true might we not confidently look for species and varieties that are in the process of becoming protectively, or even warningly colored, or the condition which we term protective simulation not quite obtained? If perfect protection is never quite reached, does not this of itself presuppose progressiveness and, therefore, instability? May we not, in fact, in the future come to measure the antiquity of some of our species by the degree of perfection with which they are mimicked by others? It would probably necessitate remaining together through a long period of time in order to enable an unprotected, younger and therefore less stable form to gain protection from a distasteful form, especially as the advance in that direction must necessarily come from the weaker, unprotected and younger form. To illustrate, our *Danais archippus* is supposed to be a very old species, while *Limenitis disippus* is supposed to be a much younger species. What is true here would also obtain in the case of *Podosesia* and *Polistes*, thus indicating the greater antiquity of the latter, though probably belonging to a younger order than the former. Mr. Gahan has shown* that there is a remarkably close resemblance between seventeen species of *Diabrotica*, inhabiting Mexico and Central America, and an equal number of species of the genus *Lema* occurring in the same section of country. Among the species of *Diabrotica* given, but one, *D. vittata*, is known to occur north of Mexico, and none of the species of *Lema* here sufficiently resemble any of the species of *Diabrotica* to lead to the suspicion of protective mimicry. In fact, it is only along the Mexican border that we have any striking resemblance between any of our species and those of the latter genus. In the states bordering on Mexico, Professor Wickham tells me that *Andrector 6-punctata* bears a striking resemblance to *Diabrotica 12 punctata*, and another species of *Andrector* is very much like *D. tricincta*. There is no positive proof that these are cases of protective mimicry, and Mr. Gahan does not claim this for the cases of close resemblance to which he calls attention, but in all of these there are certainly strong grounds for suspecting that such will ultimately prove to be the case. I have elsewhere †shown that there is every probability that the ancient home of the genus *Diabrotica* was in northern South America, many North American species originating in Central America and Mexico. It would seem, then, that *D. vittata*, *D 12-punctata* and *D. tricincta*, having spread northward from Mexico, and being the oldest northern forms of the genus, might be mimicked in Mexico and the adjacent portion of the United States, because of having occurred there a sufficient length of time for such conditions to be brought about, while farther north they, with the rest of the genus, are comparatively recent comers, and sufficient time has not elapsed to develop cases of protective mimicry.

In conclusion, I desire that nothing in this paper shall be so construed as to, in the remotest degree, favor hasty or unwarranted conclusions in studies of warning colors, protective mimicry or protective coloration, but I do wish to urge that the same caution and painstaking labor should characterize our action in rejecting, finally, possible cases of these phenomena that would be exercised before accepting such, were the possibilities

*Trans. Ent. Soc. Lond. 1891. pp. 367-374.

†Jour. N.Y., Ent. Soc. Vol. III., pp. 158-166.

greater or amounting to probabilities, that we shall lean no more or less to the pessimistic than to the optimistic, but weigh every fragment of information, be it negative or affirmative, with equal care and discretion.

The points that I have tried to emphasize are:—(1) That a form of animal life may be distasteful to other forms, and so far as these are concerned, warningly colored; but neither the one or the other, where the form to be protected from is not a persistent and perpetual enemy, that, unrestrained, would threaten the extinction of the form preyed upon; (2) That a mimicking form may profit by a protective resemblance, not only where both it and the form mimicked occur together, but throughout the area of distribution of the deceived form, whether the mimicked form be present or not; (3) That a form, closely resembling in appearance a mimicking form, though occurring at a different time of year, or in a different locality, may profit to a greater or less degree by such resemblance, even though both mimicked and mimicking forms are absent, provided, however, the form protected from has somewhere come in contact with the distasteful form and learned by experience that it is inedible; (4) That we may and probably do have cases of partial deception, and, therefore, partial protection; (5) That cases of mimicry may occur where, owing to the fact of the enemies having become exterminated, or the mimicked and mimicking forms drifted into places inaccessible to such enemies, no protection is given or required; (6) That these problems are most far reaching, and we have as yet scarcely begun to study them in their entirety, hence the fragment hove over among the rubbish may yet prove to be the keystone of the archway through which we are to make our way into one of the grandest and most sublime of nature's many temples.

THE SAN JOSE SCALE.*

By F. M. Webster, Wooster, Ohio.

My topic is not of my own choosing, but the one assigned me by the Vice-President and also by the Secretary of the American Association of Nurserymen. I mention this fact, not in the way of compliment, but because so much has been said in public print regarding this pest during the last year or two, that I may not be able to present much that is new. About all that I shall attempt to do will be to bring together all the facts in our possession and point out to this association, for its consideration, some lessons that the past has taught us, and the possibility of profiting by such lessons in the future. To me, though not a nurseryman but one whose business it is to protect some of their interests, the introduction of the San José scale into the country lying to the east of the one hundredth meridian, and its suppression, so far as this has been accomplished, has meant something more than the mere study and investigation of the pest; more even than the overcoming of it and preventing its further diffusion. It has appeared to me as though, in the last half of the last decade of the nineteenth century, there had been presented to our people a test case, as it were, as well as a reminder that the coming twentieth century would bring to us problems which we had not previously been called upon to solve. The question that seemed to me to be involved was this: Can a republican government, composed of nearly half a hundred minor governments, protect its people from the ravages of a diminutive insect pest that has been introduced among them to devastate their orchards and fruit farms? What will be done under such circumstances, and who will be the ones to do it? This scale is a serious pest, but is it not, besides this, the straw that denotes the direction toward which the wind is blowing? We have but to cast our eyes toward the State of Massachusetts where a fierce battle is being carried on against another imported pest of our orchards

* This valuable paper, read at the Twentieth Annual Meeting of the American Association of Nurserymen, at Indianapolis, Ind., June 12th and 13th, 1895, has been kindly furnished us by the writer, and will be found well worthy of perusal in view of the fact that this insect may at any time be found in Ontario. —Ed.

and forests, solely by one member of this republic, while the others are simply spectators looking on with a disinterestedness that amounts almost, if not quite, to a total indifference. These are the two at present, most important introductions of foreign insect pests, but no one can for a moment suppose that others will not follow, coming as with the San José scale, from we know not where. You, gentlemen, are engaged in a business that necessitates the exchange of scions, grafts, trees and shrubs, but may also be disseminators of these pests not alone to your customers, but to each other. And, whether you will or no, you cannot escape being foremost in the settlement of a problem that half a century ago was unthought of. Hence, while I address you on the subject of the San José scale, it will be to view it as a factor in what seems to me to be a great and difficult problem in the future of your business; and with this explanation I will proceed to consider that factor.

The San José scale was first observed in this country in the locality in California from which it derives its name, coming from we know not where, but probably from either some of the islands of the Pacific or else some of the Asiatic countries beyond. This introduction is thought to have taken place about the year 1870, and began to attract the attention of fruit growers about three years later, but so far as known only in the locality above indicated. In 1880 Prof. J. H. Comstock described the species, and wrote as follows: "It is said to infest all the deciduous fruits grown in California, excepting the peach, apricot, and black Tartarian cherry. It attacks the bark of the limbs as well as the leaves and fruit. I have seen many plum and apple trees upon which the fruit was so badly infested that it was unmarketable. In other instances I have seen the bark of all the small limbs completely covered by the scales. I think it is the most pernicious scale insect known in this country." For the reason here given, Prof. Comstock gave it the name of *Aspidiotus perniciosus*, and I may here add that it has since been found to occur on both the peach and apricot, and fully merits the name given it by the describer. It appears to have spread quite rapidly, for in 1882, nine years later, it had extended over all of the fruit growing regions of California and across Oregon into Washington. As late as 1893, the Los Angeles Horticultural Commission, in their report for that year, stated that the pest, if not speedily destroyed, would utterly ruin the deciduous fruit interests of the Pacific coast; that it not only checks the growth of the trees, but covers them literally entirely, and the fruit nearly as much so, and, if left unchecked, the tree is killed within three years' time. This will serve to show you the serious nature of this little pest, as demonstrated by its twenty-five years' residence on the Pacific coast.

I will occupy a few moments here to consider its probable origin, though, as before stated, we do not as yet know the land of its nativity. It is found in Chili, but was clearly introduced to that country from California. It also is found in Hawaian Islands, having been introduced from California on prune and peach trees, and also in Australia. But nowhere in these countries has it been found inhabiting indigenous vegetation, which we entomologists claim, must be done in order to prove the nativity of the pest. Quite recently, Professor Cook has sent it from California on the Loquat, *Photinia japonica*, and, as will be observed, there are several of our forest trees included in Dr. Lintner's list, but this proves nothing as it would be surprising if, in its twenty-five years' residence in this country, it had not begun to adapt itself to our native flora, precisely as some of our native parasitic insects are beginning to learn that they can add it to their bill of fare. Considerable of the nursery stock required in California is grown on some of the smaller islands of the Pacific, as for instance, Tahiti, and it seems at least possible that we may in this way have acquired a pest that may be an inhabitant of an obscure island, and, for aught we know, it may be so inconspicuous there as to require the trained eye of the naturalist to detect it.

The insect itself, Fig. 83, belongs to a group known as armored scale insects, their nearest allies being the Oyster-shell Bark-louse, while still farther removed are the Mealy-bugs. We have here in the east a somewhat similar species that I have found on peach, plum, pear and maple. This is known as the Putnam scale, *Aspidiotus ancylus*,

having been first described by the late J. Duncan Putnam, from Iowa. It is known to occur on the following plants also, ash, beech, bladder-nut, hackberry, linden, oak, osage-orange and water locust. This is often mistaken for the San Jose scale, even by those

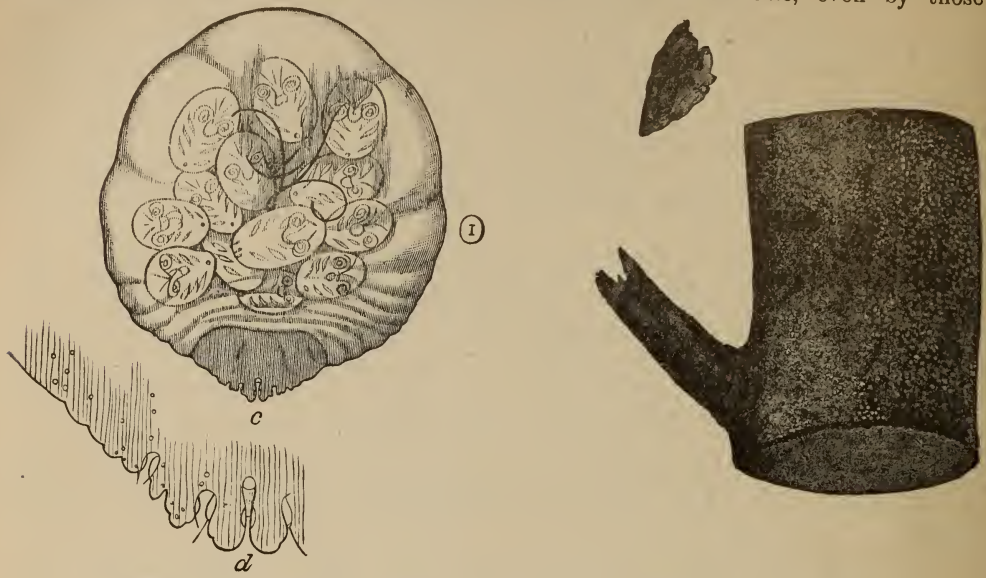

Fig. 83.—San José Scale, female enlarged and part of infested branch (life size.)

who are quite familiar with the latter. My own manner of distinguishing between these two scales is to first observe if the disc is circularly wrinkled and the elevation in the centre surrounded by a depressed ring ; if the scale is very flat, or if it appears to rise

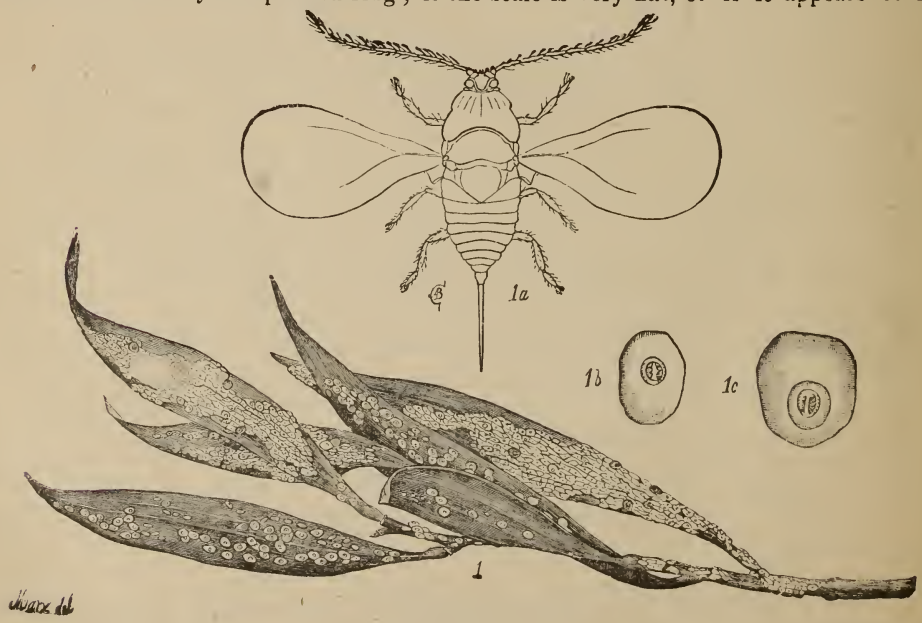

Fig. 84.

gradually from the outer edge to the base of the elevation ; if the scales are disposed to crowd in compact patches. If the disc is circularly wrinkled with a deeper ring about the base of the elevation ; if the scales crowd each other closely and give the tree a gray

appearance, it is the San Jose scale. If the disc is smooth, and the central point rises out of a smooth area, it is probably the Putnam scale. Another scale that has come to me several times as the San Jose scale, is the Oleander scale, *Aspidiotus nerii*, Fig. 83, which also attacks ivy. But this is of a lighter color, flatter and longer.

The Rose scale, *Diaspis rosæ*, has been sent me, both on the rose and raspberry, with the query as to whether or not it was the San José scale. But this is also larger, more depressed and of a lighter color. In short, we have nothing that clusters so thickly together on the host plant, and gives it that peculiar gray color, which once seen will never be mistaken for anything else.

In regard to the life history of the species now under consideration, it appears to differ from that of many of our scale insects in that instead of reproducing by laying eggs, the mother gives birth to her young. As by far the most careful studies made on this species have been carried on at the Department of Agriculture, under the direction of U. S. Entomologist, Dr. L. O. Howard, I take the liberty of giving Mr. Howard's statement in his own words. He says: "Although this insect has been known in California for about twenty years, its life-history has not been carefully worked out by California writers. Professor Comstock described simply the male and female scales and the body of the adult female. The male was unknown to him. In his work on the Injurious Insects of the Orchard, Vineyard, etc., published at Sacramento in 1883, Mr. Matthew Cooke briefly described the male insect and published a crude figure of it. He further stated that the species produces three broods in California, the first "about the time the cherries begin to color, the second in July, and the third in October." The statement is made by Comstock that the eggs are white," and Cooke further says that "each female produces from thirty-five to fifty eggs."

"Upon the appearance of the insect in the east, potted pear trees were secured for the Insectary of this division, and colonies of the scale were established on them. Their life-history has been followed with more or less care throughout the season, and the following brief statement of the life cycle of the insect is based upon daily observations made during the summer by Mr. Pergande.

"It has already been ascertained during the late summer and fall of 1893 that the insect is viviparous, that is, gives birth to living young, and that it does not lay eggs. We are unable to reconcile this condition of affairs with the statements just quoted from Comstock and Cooke, but it occurred to us that, as with certain of the plant-lice, there might be winter eggs, with viviparous females in summer. When winter came on, however, it was found that the insect hibernated in the nearly full grown female condition, and that these females, about the middle of May, began to give birth to living young as their ancestors did the previous fall. In no instance, therefore, have we observed the egg (unless the young still in the body of the female and enveloped in the embryonic membrane may be so called). Over-wintered females continued to give birth to living young day after day for six weeks. This condition of affairs produces, early in the season, a confusion of generations, which makes observations upon the life-history of the insect extremely difficult and only to be accomplished by isolation of individuals. It also seriously complicates the matter of remedies, since, as numbers of the larvæ are hatching every day, and as they begin to form their almost impervious scales in two or three days, a spraying operation at any given time will destroy only those larvæ which happen to be at that time less than three days old, while on the day after the spraying new larvæ will be born to take the place of those just killed.

"Observations upon isolated individuals show that the newly hatched larvæ, after crawling about for a few hours, settle down and commence at once to form a scale. The secretion is white and fibrous. In two days the insect becomes invisible, being covered by a pale, grayish-yellow shield, with a projecting nipple at the centre. This nipple is at first white in color. Twelve days after hatching, the first skin is cast. The males at this time are rather larger than the females, and have large purple eyes, while the females have lost their eyes entirely. The legs and antennæ have disappeared in both cases. Six days later the males begin to change to pupæ, while the females have not yet cast the

second skin. At this time the females are so tightly cemented to the scale that they cannot be moved without crushing. In two or three days more, or twenty to twenty-one days after hatching, the females cast their second skin, which splits around the margin of the body. At twenty-four days the males begin to issue, emerging from their scales, as a general thing at night. At thirty days the females are about full grown, and embryonic young can be seen within their bodies; and at from thirty-three to forty days the larvæ begin to make their appearance.

"These observations were made upon young which were born of over-wintered mothers late in June; but it must be remembered that similar larvæ had been hatching since the middle of May. The period of thirty-eight to forty days may be accepted as the length of time occupied by a single generation; but, while this particular generation came out in the insectary about the 1st of August, the adults of the second generation from the earliest born individuals would have made their appearance toward the end of June. Full grown females which began to give birth to the second generation of young on August 1 were kept in view. Three weeks later they were seen still to contain numerous embryos. Young larvæ were running about, while others of the same generation were in all stages of development. The male scales were fully formed, and some contained mature pupæ. The small trees upon which these insects were colonized the third week in June were almost completely covered with the scale. The larvæ evidently made no effort to crawl away from the tree, and none, in fact, reached the rim of the flower pot. The greatest distance away from the tree at which larvæ were noticed was about two inches. Up to this time the insects had confined themselves almost entirely to the branches, and the leaves were still quite free. The first males of the second generation were noticed on August 27. By September 7, or five weeks and a half after the adult females of the first brood began to give birth to young, some of them were still living and giving birth to occasional young. The majority of them, however, were dead or nearly exhausted, while their first larvæ were almost ready to reproduce. Five days later a few of them were still giving birth to an occasional young, while their offspring were also rapidly reproducing.

"At the rate of development observed, between May 15 and October 15 four generations from the over-wintered females developed. The larvae continued to issue until after the first frost in October, at Washington, and on October 24, at Lewisburg, Pa., the writer saw recently-settled larvæ of not more than five days of age.

"There seem to be five generations in the latitude of Washington. Owing to the method of reproduction, these generations immediately become inextricably confused, and the insect after the middle of June may be found at any time in almost any condition. The females which over-winter have, in the great majority of cases, reached a sufficient degree of maturity to have become impregnated by late issuing males. It seems probable that the male rarely hibernates in any stage, although we received on April 3, from Charlottesville, Va., twigs which carried a few male scales containing males in the pupa state. These probably hibernated as full grown male larvæ. Whether unfertilized females over-winter we are not certain; if they do, these occasional over-wintering males will fertilize them.

"The San José scale differs from all others in the peculiar reddening effect which it produces upon the skin of the fruit and of tender twigs. This very characteristic feature of the insect's work renders it easy to distinguish. Around the margin of each female scale is a circular band of this reddish discoloration, and the cambium layer of a young twig where the scales are massed together frequently becomes deep red or purplish. Small spots on fruit produced by a common fungus *Entomosporium maculatum*, Lev., sometimes so closely resemble the spots made by the scale as to require close examination with a lens. When occurring in winter upon the bark of a twig in large numbers, the scales lie close together, frequently overlapping, and are at such times difficult to distinguish without a magnifying glass. The general appearance which they present is of a grayish, very slightly roughened, scurfy deposit. The rich natural reddish color of the twigs of peach and apple is quite obscured when these trees are thickly infested, and they have then every appear-

ance of being thickly coated with lime or ashes. Even without a magnifying glass, however, their presence can be readily noted if the twig be scraped with the finger nail, when a yellowish, oily, liquid will appear, resulting from the crushing of the bodies of the insects."

The female scale is flat, almost circular in outline, dark mottled with gray color, with a small elevated spot at or near its centre which is black or yellowish; it measures about one sixteenth of an inch in diameter, but under favorable conditions may attain to the size of one-eighth of an inch The fully developed female can only be observed by removing the scale with which it is covered at a time when she is just about to give birth to her young. She will have then lost both her legs and antennæ, being now only provided with a long delicate proboscis consisting of four thread-like bristles encased in a two jointed sheath. The body is almost transparent, and the young can be clearly distinguished within.

The male scale is black and somewhat elongated when fully formed. It is often oval in shape, smaller than the female, and more abundant. The larval skin is covered with a secretion, and its position is indicated by a single nipple-like elevation between the centre and anterior margin of the scale. The fully developed male only has wings. The body is of a light amber color with dark brownish markings, and terminates in a slender stylet as long as the body. It is, however, too minute to be of interest to any but naturalists, having to be always examined with a microscope.

Such was the pest that was, as we supposed, lurking only along the Pacific coast, with a vast width of mountain and desert lying between it and the fair lands and thrifty orchards of the Mississippi valley and beyond. We did not for a moment dream that the pest had gained a foothold along our eastern coast as well, and was each year being sent into the heart of our land, and even the entomologists were in blissful ignorance of its presence. In 1892, Professor Townsend had reported it at Las Cruces, New Mexico, but that was almost as far off and isolated as California, and we still slept on in our supposed security. Early in August, 1893, there came to the Division of Entomology at the Department of Agriculture at Washington, a small bundle of pear and peach twigs from Charlottesville, Va., the sight of which fairly raised the First Assistant Entomologist, who examined them, out of his chair, for he at once recognized the San José scale. But even yet it was thought to be only an accidental occurrence. Later investigations of another outbreak indicated that the pest had come from a prominent nursery in New Jersey, and on being inspected the insect was found to have become thoroughly established and probably had been for several years, as the trees whereby the insect had been traced to this nursery had been sent out in 1888. I shall here follow a policy that has always appeared to me to be the only just one for an entomologist to follow, and give the name of the nursery, which is that of Mr. John R Parry, of Parry, New Jersey. This was the first intimation that this firm had of the seriousness of a pest that they failed to recognize, though on referring to their books they found that in 1887 they had ordered from John Rock, of San José, California, a quantity of Kelsey's Japan plum trees, and that these trees had been shipped by Mr. Rock's order from the nursery of the Stark Brothers, of Louisiana, Missouri.*

*Mr. Stark, of this firm, made the following explanation at the close of the reading of the paper:—

As Prof. Webster mentions our name, we wish to state the circumstances in full as we now recall them: In 1885, we had the pleasure of visiting the nursery of John Rock, at San José, California. Mr. Rock is well known as one of the principal California nurserymen, and it is needless to say that the visit was interesting, and instructive as well. Among other things particularly noted, was his method of treating trees before shipment to destroy the San José scale. This method he supposed to be entirely effective, and, remembering this, in the spring of '87, the Kelsey plum being then a scarce novelty, we ordered a lot of first-class Kelsey plum trees from Mr. Rock; but as a good many of us have learned "first-class" trees on the Pacific coast mean a very different thing from first-class trees in the east. On the coast, it seems they sometimes go into rows of one year trees and dig about everything clean that is thrifty and two or three feet in height, or even less; so when the trees arrived and the lid was removed from the box, showing one year trees running from about eighteen inches in height upwards, it was apparent we could not accept nor use the grade and we so wired Mr. Rock, who wired in reply to express them to the New Jersey parties, and the trees accordingly were immediately expressed to Messrs. Parry and to J. T. Lovett, thus quickly removing every one of these Kelsey trees from our grounds—a most fortunate circumstance for us, as it has since appeared.

The Parry people were as much astounded at the revelation as were the Government Entomologists, and promptly destroyed over $1,000 worth of stock, and as promptly stopped shipping anything from their nursery, buying from localities that are even now beyond the area of infection, the trees whereby to fill their orders. From this time on this firm has followed this policy and bent their whole efforts on stamping out the pest on their premises, sparing no expense in the accomplishment of their purpose. I cannot myself find words to express my own commendation of the course of this firm, and I do not believe that the American people will overlook or underestimate the public spirited acts of the Messrs. Parry. Had all of those who are engaged in your vocation, and were similiarly unfortunate, followed this course, the entomologist and the agricultural press might have been spared the unenviable task of exposing their disgrace. The introduction of the San José scale from California was a sad piece of carelessness on the part of at least four firms of nurserymen, as either one, had they applied to the Department of Agriculture, might have learned and avoided the danger, as the Division of Entomology had, at the time the introduction took place, two of its special field agents in California, and would most certainly have pointed out the danger had an opportunity been presented. Up to the time that the proprietors were notified of the presence of the pest, then, carelessness only can be charged against them, and they should be judged according to their acts since that time. The Parry Brothers, when the pest was found established on their premises, asked that the fact be withheld from publication, as it would otherwise ruin their business. Considering the efforts being made by them, it was certainly no more than just to give them an opportunity to show what they could and would do, and as we yet have no reason to suspect that they have betrayed the confidence placed in them by the Government and State Entomologists, and, besides, they have willingly furnished entomologists with a list of purchasers who were liable to have received the pest with trees sold from their nursery, prior to this discovery of its presence among their nursery stock. What more could they have done to undo the wrong, or prevent its continuation?

Soon after the foregoing outbreaks of this pest had been investigated, another badly infested nursery was located in New Jersey, that of the Lovett Company, at Little Silver, and which, as we now know, was infected in precisely the same way and at the same time as the first. This nursery was known to be infested as early as September, 1894, when it was visited by the entomologist of the Experiment Station of that State, and the fact pointed out to the officers of the company, who promised to destroy and disinfect their trees before sending them out to their customers. The New Jersey entomologist took upon himself the responsibility of stating in public print that these precautions were being taken, and that everything possible was being done by the company, whose name he did not give, probably supposing that he was dealing with men who would readily see that their own interest would lead to such a course, and was not as active in holding them to their promise as he would have been justified in doing. It was late in December—over three months later—that I received twigs of apple infested by this scale from Clermont county, Ohio, and on promptly visiting the orchard found some twenty-five trees literally covered with the pest, and three times as many more infested to a large degree, but all in such a condition that sixty of them have since been dug up and burned. These trees had been purchased from the Lovett Company and planted out in spring of 1890. In a note given to the daily press on the discovery of this serious outbreak, I stated the fact that the trees had been purchased from this firm, but did not accuse them of having, at that time, the scale among their trees, though the fact was not unknown to me. Promptly on the appearance of my note came a letter to the Director of the Ohio Experiment Station, which ran as follows:

LITTLE SILVER, N.J., December 28, 1894.

Director Experiment Station, Columbus, Ohio:

DEAR SIR,—One of our customers has sent us a clipping from a Columbus paper, in which is stated that trees owned by one Mr Nicolis have been found infested with the San José scale. You will please give us all the information you can in regard to this matter. We would like very much, indeed, to have some branches from the trees referred to for examination ourselves. We have made a critical examination of our trees here in the nursery and also fruiting trees, using the microscope, and can find no trace whatever upon any of them of the San José or other scale. Having read reports upon the San José scale, we are confident that we could detect this insect if it existed upon our trees.

Yours truly,

(Signed) THE LOVETT COMPANY. H.

Now here was a serious state of affairs indeed. An official entomologist, whom I had known for years, had given the information, and here was a firm assuming their innocence, and being compelled to go over a whole nursery with a microscope, in fruitless search after the San José scale. Gentlemen, did any of you ever attempt to go over a tree with a microscope? And do you remember how much time it required to accomplish the task; how tiresome it was and how weary you were long before you had finished? Yet here were men compelled to go over a whole nursery, because of an unjust accusation. I promptly sent a copy of the letter of the Lovett people to the New Jersey Experiment Station and asked them to explain the matter. They were able to explain everything except the conduct of the firm, but at that were as much astounded as I was, and again reiterated the statement in regard to the examination with the President and Secretary of the company the preceding September. A month later, in February of the present year, Dr. Lintner, State Entomologist of New York, asked them to furnish a list of their sales in his State—such as had been freely and gladly done by the Parry Brothers—explaining at the time its character and the value it would possess in undoing the wrong that they had unintentionally done. After much delay and dickering, the Entomologist of the New Jersey Station received the following modest proposition: "If he (Prof. Lintner) will send us, or you either, a remittance of $250, we will attempt to make the examination desired. But we want a clear understanding before we begin as to the settlement of cost of sending the list he requires." I need hardly say that the money was never sent for there is little doubt but that the list would have been as "scaley" as their trees. Public indignation, however, had been rapidly increasing, and on February 22nd, the Entomologist of the Experiment Station accompanied by a member of the editorial staff of the Rural New Yorker, paid this nursery a visit of investigation, and found that while some more or less effective means had been employed to destroy the scale, there was ample evidence of a carelessness that in many countries would have been considered criminal and cost the firm their plant, if, indeed, imprisonment were not added. I can only repeat here what I said of the action of the first-mentioned firm: it will be a long time before the people will forget these things, and all statements of the Lovett Company will be taken on probation, which probation will, if I mistake not, be a protracted one.

Even while the foregoing developments were proceeding, we became aware that there was another locality of distribution of this pest; viz', Long Island, N.Y.; and it was toward this part of his State that Dr. J. A. Lintner, State Entomologist, turned his attention, with the hope of protecting his people from having the scale distributed among their orchards and farms by Long Island nurserymen.

Dr. Lintner was only faithfully carrying out the duties of his office, and went about doing that duty in a moderate, conscientious manner, that ought to have received the unqualified support of every fruit grower and nurseryman in his State. But he soon found that he had the same diversity of character to deal with as had been revealed in New Jersey. Of the nine nurseries located on the island, but three were found to have become infested, and these, as given in a recent bulletin from the New York State Museum (Vol. 3, No. 13) are owned and operated by Fred. Boulon, Sea Cliff; Keene & Foulk, Bloodgood Nursery, Flushing; and Parsons & Son, also of Flushing. The first named, though moving in a somewhat dilatory way, finally destroyed his worst infested trees and sprayed so that it is hoped that no infested stock will be distributed. Of the actions taken by the second named firm, Dr. Lintner, in his bulletin above referred to, speaks in terms of highest praise. As soon as this firm learned of the presence of the scale on their premises they promptly burned the worst infested trees and sprayed the remainder, besides asking for instructions and directions in regard to methods of suppression, they have promptly carried out every one of these, making every effort possible to protect their customers, offering on request to replace at half price all trees sold from their nursery, during previous years, that were found infested by the San José scale. There seems to be no reason why this firm should not continue to enjoy the confidence and patronage of the public. The last firm mentioned, Messrs Parsons & Sons, chose an opposite course, and I may add, deserve opposite treatment. From the first,

this firm paid no attention whatever to the evil, when it was pointed out to them, and when asked to disinfect their stock before shipping it to their customers, stated that they would if they had time; and, later, said they did not have time. There is very strong evidence in the hands of entomologists going to show that this firm made both their last fall and spring shipments, knowing that they were unloading their scale infested trees on the public and scattering this pest, the serious nature of which they could not help knowing, far and wide over the country. Failing in every attempt to secure satisfactory replies to his communications, or even a list of the patrons who were likely to suffer from their imposi:ions, and after your humble servant had pointed out to him that he was only being imposed upon and his moderation toward this firm only being used to further their scheme of unloading their infested trees on the unsuspecting public, that he was forced to call upon the "Rural New Yorker" to expose them. In the issue of that publication for May 4, 1895, the editors, after exposing the Parsons Company, say that the Company made a plea of ignorance of the serious nature of the pest, and supposed it was only one of the many scales that they had known for the last fifty years. No wonder that the "Rural New Yorker" people were boiling over with indignation over a course that was alike unprincipled and un-American, and ask why it was necessary for them to come forward and make business men attend to their duty, telling the company that it was no excuse at all for them to plead ignorance of the dangerous character of the pest and neglect the repeated warnings that have been given. To plead ignorance was a direct insult to State Entomologist Lintner, who had again and again warned them of it and urged them to take immediate steps to prevent distributing it all over the country. These people now, after being publicly exposed, promise to do all in their power to prevent sending out infested stock, and if the public deal with them as they deserve, it will be some time before they will distribute their trees at all, for who will expect them to keep any promise after such evasions as they have attempted? If the entomologists and the press are not again called upon to expose them a second time, it will be a pleasant surprise.

Now, gentlemen, I have criticised harshly, but I sincerely believe not unjustly. I have exposed these people before you, not in order to taunt you with the disgrace of some who follow your calling, but because they threaten interests of yours that I am employed to protect. It is my business and duty to do so. You do not need to deal with these people yourselves to suffer contamination. Let me explain, and this I will do by illustration. Last winter a man came to me in high dudgeon and wanted me to show up a prominent firm of nurserymen in Ohio. He said that he had gone to them in the fall to buy trees. He did not appear to care much what the trees were so long as they were fruit trees and cheap. He said that he had gone to this nursery and found what he thought would answer his purpose, provided the price was right. The trees were poor and expected the price to correspond, "but do you believe," he said, "them galoots wouldn't sell me them trees at any price and said they were going to burn them up, I suppose just to make me pay a big price for others. But I won't do it. I'll buy where I can get what I want and at a reasonable price of eastern nurseries." Now, we all know what sort of a fruit grower such a man would make. One of the sort that sets out his trees and then lets the pigs, cattle, sheep and horses take care of them, and who, if he were to buy scale-infested trees would not find it out until the whole neighborhood was endangered. Suppose such a man buys scale-infested trees and plants them out in your neighborhood, thereby threatening your business, what will you do about it? If he furnishes scale enough to destroy a thousand dollars worth of your stock and ruin your trade for several years, you cannot help yourselves, in the present condition of our laws. You cannot reach the man who sold the trees, and to destroy them on your neighbor's premises without his permission, is to criminate yourself. I have no fears of the pushing, up-to-date fruit grower or the honorable nurseryman, for if they have the misfortune to get this pest, they will stamp it out without compulsion. But I am afraid of the nurseryman who will knowingly or carelessly distribute this pest to careless or indifferent purchasers; and this is precisely where we entomologists are

expected to protect you. In order to protect the people of Ohio, I have felt from the start that it was necessary to first prevent this pest being continually shipped in from infested nurseries, and then use every means to find out infested localities and stamp it out. This is the only way that I can protect the people of my State, both nurserymen and fruit-growers. What is true of Ohio is true in other States, and of other entomologists.

It seems to me that what we need is a United States law, that shall apply equally well in every State in the Union, that will enable those nurserymen who wish to do so, to send their authorized agents into any State to do business, each firm being thus responsible for the acts of their agents. If nurseries desire to sell stock in States other than their own, or the people desire to purchase such stock, they should have legal protection. Then let every nurseryman be obliged to warrant his stock free from insect or fungus pests before transportation companies can accept the same for shipments. This will do away both with the disreputable nurseryman and the tree-peddler, and place your business in the hands of honorable men. You may think it an objection, and possibly a hardship to thus be obliged to guarantee your stock free from these pests, but I fully believe it is precisely what you are coming to and of your own accord. I am fully convinced that within the next ten years every reputable nurseryman will spray his nursery stock several times each year with both insecticides and fungicides, not because he is obliged by law to do so, but because it will pay him well for the extra time and expense. We are beginning to learn that the apple scab begins to weaken the vitality of a tree from the first year onward, and the same is true to some extent with insect pests, that by spraying the nursery rows you can produce a greater number of first class trees to the acre, and so derive a larger profit from your land and the labor bestowed upon it. Now, this is only a suggestion whereby this problem of distributing such pests as the one under consideration can be prevented, at little or no real expense, and those more competent than myself can no doubt improve on the suggestion, and you will readily see that when another case like this comes up, and a nursery is found to be infested the owner has only to purchase his stock for a year or so of his more fortunate neighbor, until he can cleanse his premises and use his product. This will also do away with an injustice that I have seen all along, and, in fact, been obliged to, myself, make use of. I stated at the beginning of this paper that it was but right to give a reputable firm time in which to show what they would do to protect their customers, but it is a rank injustice to others of his profession to publish the fact of the occurrence of such a pest as this in a certain locality or State, and not give name in connection with such information. I am bitterly opposed to the policy that I have been obliged to follow during the last year, knowing, as everyone must, that to quarantine against areas instead of individuals, must work an injustice upon the very ones that are the most deserving of justice. When the word goes forth that this pest is in a certain State and liable to be distributed from it to others, the only protection for the others is to stop all shipments from the whole State, when there may be but a single nursery infested. This is the rankest kind of injustice, and I hope some measures will be devised to prevent a recurrence of such a condition of affairs as we have had with regard to the suppression of the San José scale. I have been obliged to warn the people of Ohio against New Jersey and Long Island, when I knew it was a wrong to the very men that I was trying to help, simply because I could not get the names of the guilty ones, and indicate them to our people. I hope, gentlemen, before you adjourn from your deliberations, you will take some action not only denouncing the course taken by the two nursery firms that I have named, but indicating some policy whereby this problem can be met in a judicious and at the same time thoroughly efficient manner. The San José scale is the latest importation, so far as we know, but it is not at all likely to be the last. Our commercial relations with other countries are not only increasing rapidly and broadening, but the time required for transporting your goods from place to place has been diminishing much more rapidly. It is now possible to remove plants from their native homes in Australia, South Africa, Europe or Asia, and in the short space of a month's time scatter them over the whole country. Destructive insects may thus go into their dormant stage in one country and

emerge in another without having been disturbed or discommoded, something that would have been impossible twenty-five years ago. With such strides, such progress in these factors in your business, it will be absolutely necessary for you to bring your business methods up to date, and change to meet your changed conditions. By necessity, you are foremost in the diffusion of these pests of your trees and plants, and it would appear to naturally follow that you should be foremost in taking steps to prevent this diffusion—should lead instead of follow—and I hope you may begin to recognize the situation, and with past experience to guide you, look into the future and prepare to meet these emergencies and overcome them.

Returning for a moment to the San José scale, before closing, I will say that the insect does not appear to spread rapidly, at least not at the start, and is not so difficult to overcome, if given prompt and careful attention. At present it would seem as though it might be wholly eradicated from the orchard or nursery within a year after being discovered. Whale-oil soap, one pound to each gallon of water, makes a wash that is most fatal in its effects, when applied during autumn and again just before the buds start in the spring, followed by a similar treatment in autumn. The use of hydro-cyanic acid gas is thoroughly effective, and though rather expensive to use in an orchard, is not so much so where trees can be treated in bundles. Full instructions for using this may be had on application to the United States Department of Agriculture at Washington. It is true that this scale is now established at several points in most of the States east of the Mississippi river, but I am satisfied that all such can be stamped out, provided proper attention is given the matter now while it is yet confined to the orchards into which it was originally introduced. For the present this is the only protection that the nurseryman and orchardist have against this pest, or rather, I might say, against a disreputable fellow of his calling, or a shiftless neighbor; and I would caution you all to keep close watch of orchards in your respective neighborhoods, especially such as have been planted out within the last five years with other than home-grown trees. I find that in some quarters there is a disinclination to let the matter of infection become known. So far as the farmer and orchardist is concerned this is folly, as to have acquired this pest is no disgrace, but a misfortune, and I find that the statement that it has been discovered in a certain locality and promptly eradicated, is an incentive for others to look more closely to their trees and, in case the scale is found, follow the example of their neighbors.

In closing, I wish to call the attention of nurserymen to the fact that the entomologist is working for their interests, both in the matter of protecting them from getting such pests established in their nurseries, and aiding them to get rid of them in case they have been unfortunate enough to have done this. To prevent sending out infested trees from any nursery is a part of the duty of an entomologist, however disagreeable it may be to do so. So long as men are human, it will be necessary to resort to disagreeable methods of preventing them from wronging each other, and the best that can be done is to deal with strict justice toward all.

At the conclusion of Prof. Webster's paper, the following appreciative motion was put to the meeting and carried unanimously:

Col. WATROUS: "I think that the paper that comes out and deals with our interests as fairly and as wisely and intelligently as this one deserves a vote of thanks, and I move that a vote of thanks of this Association be tendered Prof. Webster for his paper and that we approve his course."

The CHAIR: If any of you have any questions to ask of Prof. Webster, he will be happy to answer them; or if any of you have any statements to make we shall be glad to hear them. It is certainly the most interesting subject that could come up in a convention, for it is a matter of dollars and cents for us.

Col. WATROUS asked what would be the proper course to pursue should a nurseryman be so unfortunate as to receive a bundle of trees from another nurseryman which were found to be infested by this pernicious insect.

Prof. WEBSTER: Send them back to the original nursery.

Col. WATROUS inquired further if there were any way by which the insects could be killed on imported stock so that it would be safe to plant the trees and propagate from them. I want to know if it is absolutely necessary that they be burned or reshipped.

Prof. WEBSTER: They could be disinfected by using hydrocyanic acid gas, the management of which you can get by applying to the Department of Agriculture at Washington. It is a very expensive treatment.* One receiving infested stock, if he did not send them back, could hold the trees at the order of the shipper. I do not see that the nurseryman should be called upon to take them at all or to take the responsibility and expense of disinfecting them.

Mr. JEWETT asked what had been done in California. I have heard that they have exterminated it in some localities.

Prof. WEBSTER: They have practically exterminated it in some localities; but they seem to have handled it very carelessly, and it may be said to cover the whole state more or less. They have used the lime, salt and sulphur wash. This has not been fully effective, and further than that we have found in the East that a treatment of great value in California is not so here. They have a resin wash there which it is claimed is fatal. With us it will not kill twenty-five per cent.

A MEMBER asked if there was danger of the San José Scale spreading rapidly unless infested trees were taken up.

Prof. WEBSTER: It is not the travelling of the insect itself, the spread in that way is not rapid; but it may be carried by the wind or by the young insects crawling on to birds which frequent the trees and being by them carried to other trees—so that it is dangerous to have it anywhere. It does not spread very rapidly, and if carefully sprayed it can be controlled and even stamped out. There are four or five places where I know it has been stamped out in Ohio. I would take up and burn any very badly infested trees.

A MEMBER: Could the Scale be carried from California on fruit shipped to us.

Prof. WEBSTER: Yes, it is carried all over the East; but how great the danger may be I do not know. The greater part of the fruit is consumed in towns and cities, and unless the infested fruit is thrown down so close to the trees that the young insects can make their way from the waste peeling to the tree, then there is no danger. I do not look upon this as a serious feature of the case, although it would be well to watch it.

LEPIDOPTEROUS PESTS OF THE MEADOW AND THE LAWN.

BY THE REV. THOMAS W. FYLES, F.L.S., SOUTH QUEBEC.

I very much doubt whether I shall ever see again what was no uncommon sight on the older farms in the "flats" and "intervales" of Brome, Shefford and Missisquoi counties thirty years ago, viz.:—a field of Herd's grass *Phleum pratense*, L.), clean and tall, unspecked with Ox-eye (*Leucanthemum vulgare*, Lam), Cone-flower (*Rudbeckia hirta*, L.), and Charlock (*Sinapis arvensis*, L.).

I perfectly remember the first appearance of the Ox-eye daisy in Brome. A hot, dry season or two had made a scarcity of fodder, and men had gone down to the "French country" around St. Cesaire, St. Pie and St. Marie to buy hay. In the spring, a year or two years afterwards, an old-country farmer, Mr. Terence Courtney, of Iron Hill, pointed out to me, here and there by the wayside, along the line of travel, tufts of "the daisy" which had no doubt grown from seeds shaken from the loads brought in from the low country. He cut up those on his own farm, but his neighbors were not so careful, and now, in hay time, all the meadows round are white with the troublesome weed.

* NOTE.—It has since been discovered that this treatment is not effective against the San José Scale unless applied for a longer time than can safely be done without injuring the trees treated. Dr. Howard, in a recent publication, "Some Scale Insects of the Orchard," says: "With the San José Scale the most satisfactory work can be done only with a winter wash." . . . "Up to the present writing, but one absolutely satisfactory winter wash against this insect in this locality has been found. This is whale-oil soap, a pound and a half or two pounds to the gallon of water."—J. Fletcher.

In those days there was much clearing of land on the hillsides and burning of brush heaps and log-piles, and the frequent fires and eddying smoke kept down the numbers of the insect pests of the meadow and the lawn.

The arable land, on which hardwood timber had formerly grown and which was free from stumps, was, in many districts, comparatively of small extent and was well worked. On the newly burnt land Indian corn, turnips and potatoes were grown for a season or two, and then Herd's grass seed was freely scattered to convert it into pasture.

In the neighborhood of South Quebec we have at the present day much slovenly farming. Last June I noticed a meadow in which the grass stood tall and rank and uniform, but it was a meadow of Couch (*Triticum repens*, L.). A meadow golden with that very handsome but most objectionable plant, the Hawkweed (*Hieracium Canadense*, Michx.), or blue with the Succory (*Cichorium intybus*, L) is often seen. A really good meadow of Herd's grass or clover is not common, and what an Englishman would call a fine lawn is hardly to be found in the province. The moist, salt air of the old country seems to be necessary to bring a lawn into perfect condition. It is not my present purpose to to tell of the agricultural remedies for this state of things. I have alluded to it because I wish to say that good tillage has a decided tendency to keep down the numbers of pernicious insects, and that in a well-considered and worked out succession of crops the meadow is likely to thrive. Fall plowing will expose many grubs and pupæ to the attacks of birds and the action of the frost; and cross-ploughing in the spring will give the birds further opportunities that they will be sure to profit by. The occasional removal of rail fences and the rooting out of the growth that springs up about them, will destroy the harbourage of numerous foes; and frequent mowing and the free use of the roller will not only beautify the lawn but crush out of existence many of its insect spoilers.

Of the Lepidoptera certain groups are especially *graminivorous*. They belong to t *Satyrinæ* and the *Hesperidæ* in the *Rhopalocera;* the *Ctenuchidæ*, the *Arctiidæ*, and the *Noctuidæ* in the *Heterocera;* and the *Crambidæ* in the *Pyralidina*.

Satyrinæ

The Quebec Satyrinæ are :—*Debis Portlandia*, Fabr., *Neonympha Canthus*, Bd.-Lec., *Neonympha Eurytris*, Fabr., *Satyrus Nephele*, Kirby, *Chionobas Jutta*, Hübner.

The most common of them is *Satyrus Nephele*, Kirby, "The dull-eyed Grayling." It appears in July, and frequents the open fields and the borders of woods and copses. Around Montreal it is abundant, in its season, on thistle heads, in neglected spots.

It is brown, with a broad paler brown band near the outer edge of the fore-wings. In this band are two conspicuous eye-like spots. These consist of a bluish white central spot, surrounded by a black circle and a very pale outer circle. The under side of the wings has numerous dark brown cross markings. It lays its eggs in August, and the young larvæ hibernate in the first stage.

In colour the full grown larva is yellowish green, with a dark green dorsal line and a yellow stigmatic line. It has a reddish fork at the extremity of the body.

Neonympha Canthus (Fig. 85) is smaller than *Nephele*, and is of a light sandy brown. Its spots are more numerous, and each spot on the under side of the hind wings has *two* pale rings around the black one. Note.—*At the anal angle there are twin spots close together and thus encircled.* Canthus frequents upland meadows, and appears in July. The female lays her eggs in the end of that month.

Fig. 85.

The larva is green, with darker green and yellow longitudinal lines, and it has cephalic and terminal horns. It hibernates in the last stage of its growth.

But a more hurtful, because more numerous, group of grass feeders are to be found among the

Hesperidæ.

They belong to the genus Pamphila in the Hesperidæ, and are commonly called "Skippers (Fig. 86). The most common of the Quebec species are:—*Pamphila Hobomok*, Harris; *P. Manitoba*, Scudder; *P. Peckius*, Kirby; *P. Mystic*, Scudder, and *P. Cernes*, Edwards. The three last may be seen in June and July scudding about the meadows in droves.

Fig. 86.

Mr. W. Saunders, of London, Ontario, succeeded in raising *P. Mystic* from the egg to the pupa, and has described the changes of the larva in the *Canadian Entomologist*, Vol. I., p. 65. The larva was full-grown in August. It was an inch long, onisciform, downy, with a dull reddish-brown head and a dull brownish-green body. It had many dots of a darker hue and a dark dorsal line. The second segment was whitish with a dark line across the upper surface.

Mr. Fletcher, of Ottawa, raised *P. Cernes* from the egg to the pupa. The eggs were laid on grass on the 10th of July, and hatched on the 23rd of that month. The larva was full grown in September. It was an inch long, of a purplish-brown color, mottled with grey and dark purplish-brown, and it was covered with fine, short, black hairs. It had a black head and a thoracic shield on a white collar. The spiracles were black.

Both *Mystic* and *Cernes* hibernate in the chrysalis.

P. Metacomet, Harris, hibernates as a larva (Fletcher, *25th Rep. Ent. Soc. Ont.*, p. 4).

P. Manitoba, Scudder, spends eight months, or two-thirds of its existence, in the egg. The young larvæ appear in April and are full grown in July. The butterflies come forth in August, and lay their eggs in the same month. For the life history of the species see *Canadian Entomologist*, Vol. XXVII., p. 346.

Ctenuchidæ.

Of this family two species are common at Quebec, *Scepsis fulvicollis*, Hubner, and *Ctenucha virginica*.

The imago of *S. fulvicollis* appears in the beginning of June. Its expanse of wings is about an inch and two-tenths. Its head and body are of a deep velvety purple. The antennæ are pectinated in the male, and dentated in the female. The striking feature in the insect is the broad yellow collar from which it derives its specific name. The fore-wings are of a somewhat bronzy black with the costa obscurely yellow. The secondaries are semi-transparent with black veins, and with the inner and hind margins clouded with purplish black.

The full-grown larva of this species is one inch long. Its head is glossy yellow, and its body is slate colored, striped with green, pink and pale yellow, and it has a number of small warts set with white hairs. At the end of July or the beginning of August it spins its cocoon.

Ctenucha virginica, in general appearance, resembles *Fulvicollis*, but it is a larger insect; its expanse of wings is an inch and a half. The secondaries are of a deep blue-black, with whitish edges.

The larva of this species, when full-grown, forms a cocoon of the spinulated hairs from its body; it plucks them out and arranges them, and they adhere firmly in the required shape. (*Packard's Guide*, p. 239.)

Arctiidæ.

The Arctian larvæ that have been found injurious to the meadows are chiefly those of *Pyrrharctia Isabella*, Smith and Abbott, and *Leucarctia acræa*, Drury ; both are well known. The former is that brush-like caterpillar, Fig. 87 *a*, black at the ends and chestnut red in the middle, that so often is found under boards and in out-buildings late in the fall and in the early spring. When disturbed, it rolls itself up hedge-hog fashion. It forms its cocoon, Fig. 87 *b*, in May, and the perfect insect, Fig. 87 *c*, appears in June. This last is two inches and a quarter in expanse of wings. Its colour is yellow, with indistinct wavy lines on the primaries and with dark brown spots on all the wings, and also on the abdomen. The secondaries are sometimes tinged with red.

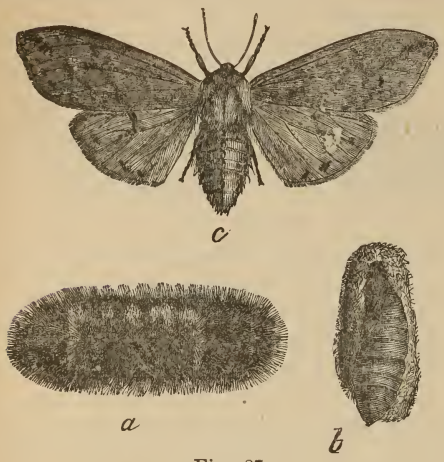

Fig. 87.

The larva of *L. acræa* is the "salt-marsh caterpillar," the ravages of which have been so well described by Harris in his *Insects Injurious to Vegetation*, pp. 351-355. It is about an inch and three-quarters in length and is clothed with long hairs, which are dark brown on the back and lighter brown on the sides Its spiracles are white. This caterpillar appears in June and attains its growth in the end of August, when it spins its cocoon. Of late years the numbers of the "Woolly Bears," as they are commonly called, have been greatly reduced by a fungus which spreads among them and destroys their vitality.

Noctuidæ.

The Noctuids are the night-flying or owlet moths. Their name is derived from the Latin *Noctua*, an owl. These moths, on warm, moist evenings, often beat at the windows of our country houses, attracted by the light. In dress they are a sober "people"—browns and drabs prevail amongst them. But innocent as they are in appearance, they, through their larvæ, work incalculable harm. Amongst these larvæ are the various species commonly classed as "cut-worms." Amongst them, too, is the dreaded "army worm."

Of the cut-worms, one that has been particularly marked as injurious to the hay crop is *Peridroma saucia*, Hübner. Of this there are two broods in the year (*Lintner's 5th Report*, p. 64). The eggs of the first hatch in the beginning of May, and the larvæ attain their grown in the beginning of June. The full grown caterpillar is about an inch and a half long. It is of a dirty greyish brown, with spots and markings of yellow and dark brown. The moth leaves the chrysalis in about twenty days, *i e.*, in the end of June. It is an insect of considerable size, the wings expanding about an inch and three-quarters. Its colour is brownish or ochreous grey, clouded and spotted with brown and with stigmata outlined with brown. The second brood appears in the fall.

Nothing in the vegetable line seems to come amiss to the caterpillars of this species. In the meadows they strip the clover and cut off the heads of the timothy ; and even the roots of the grasses are devoured by them.

The larva of *Noctua fennica*, Tausch, is another of the grass eating cut-worms. When full-grown it is about an inch and a quarter long. In colour it is velvety black, with two irregular and broken yellowish stripes on each side. Its head is brown, with a black stripe down the front, and it has a black, horny shield on the second segment. In May, 1884, Mr. Fletcher found it exceedingly destructive in meadows around Ottawa ; and in the same year it abounded in the meadows of Michigan to such an extent that, to use the words of Professor Cook, of the Agricultural College of that State : "There were meadows through which one could not walk without crushing from a dozen to a hundred at each step."

The moth is not quite as large as *P. saucia.* Its head and thorax are dark brown; the fore-wings are dark brownish grey, with a purple blush; the stigmata are clay-yellow. The renal stigma often takes the form of the letter R; near the hind margin are two small, angulated, black marks.

Another very mischievous insect of the kind we are considering is the "glassy cut-worm," *Hadena devastatrix*, Brace. It bites away the roots in the sod till the grass comes off in patches. I have seen considerable spots in the pastures and meadows of Brome laid bare by this pest.

The eggs of the species hatch early in May; and the larvæ attain their growth in about four weeks. They are glossy green in colour, with the head red, and the thoracic shield dark brown.

The moth has dark ash-grey fore-wings, with several white lines across them and some angulated black spots near the hind margin. The stigmata are black, outlined with white.

These cut-worms have been very destructive to meadows in the past, and may be again; and it is possible that other species may become so.

Another group of the noctuidæ injurious to meadows belongs to the genus *Leucania.* A very common species in the group is *Leucania pallens*, Linn., the "Wainscot moth." It may be known by its sandy fore-wings finely lined with a little darker colour, and by the three tiny black dots arranged in a triangle beyond the middle of the wing. It has white satiny hind-wings with a few brown streaks.

Leucania Henrici, Grote has dull white fore-wings with pale brown streaks. It has no black dots, and the hind-wings are clear satiny white.

Leucania commoides, Gn. is a much darker species, and may be known by the white line in the middle of the fore-wing thrown out by dark brown on either side, and branching into white lines with dark brown streaks between them. The hind-wings are dark with dark brown veins.

Leucania albilinea, Hubner is the smallest of the Canadian species known to me. It is not so dark as *commoides*, and the white central streak is branchless. This streak is thrown out by a brown one on the inner side, and, on the outer, by another which widens as it approaches the hind margin where it spreads on both sides. There is also a paler brown stripe along the costa. The secondaries are clouded towards the hind margins and have brown veins. Fig. 89 represents the eggs much magnified, and the caterpillars on an ear of wheat.

Fig. 88.

The two largest of our Quebec Leucanians are *L. unipuncta* Harv. (the Army-worm moth), and *L. pseudargyria* Guen. They somewhat resemble each other, but *Unipuncta* is of a pale reddish brown, or russet hue. *Pseudargyria* is of the tint known in the old country as "whity-brown." Moreover *Unipuncta* has a small but conspicuous milk-white dot in the middle of the fore-wing—hence its name. In place of it Pseudargyria has a pale circle, sometimes imperfect, enclosing a black dot.

When I went to live in Montreal in 1861, ("the Army-worm year"), I noticed, on the Cote-des-Neiges' road, on the wall enclosing the "Priests' Farm," a broad black line, about two feet from the ground, extending the whole length of the wall. I found it was of tar; and, on enquiring as to its purpose, I was told that it was intended to stop the Army-worm in its march from the mountain.

L unipuncta the One-spotted Leucanian lays its small,

Fig. 89.

round, white eggs at the base of the stems and within the folds of the blades of grass. They hatch in eight or ten days, making their appearance in May. In a month the larva is full grown. It is dull black lined with with white, yellow, and pink. It buries itself, forms a cist, and then turns to a mahogany brown chrysalis. The moth appears in about a fortnight.

The Army-worm in its strength is indeed a formidable foe—"The land is as the garden of Eden before it, but behind it a desolate wilderness." A correspondent of the *American Entomologist* told of the creatures coming down upon his lands in a phalanx half-a-mile wide.

Happily for the farmer there are two powerful natural checks to the increase of these troublesome pests; and often when he is at his wit's end *they* are most effective in his service. One is a fungus which spreads from larva to larva and speedily paralyzes and consumes them: the other is the Red-tailed Tachina fly, *Nemorœa leucaniœ*, Kirkpatrick, which lays its eggs upon the living larva in parts where it cannot dislodge them. The maggots that burst from the eggs destroy their victims by thousands.

Crambidæ.

A very elegant, but very mischievous group of moths are the Crambidæ or "Grass moths," of which we have many species. Their larvæ form silken tunnels at the roots of grasses and work unseen. Their retiring habits make it difficult to follow them in their career; and but little is known of the life histories of most of the species. Dr. Lintner has given us a good account of *C. vulgivagellus*; and other writers have afforded us glimpses of a few of the rest. In the dearth of information the following particulars concerning *C. Girardellus* may be of interest.

Notes on Crambus Girardellus.

Eggs.—Laid dispersedly, pale yellow, melon-shaped, ribbed and cross-lined; hatched the first week in August.

Young larva.—One-twentieth of an inch long; head and second segment dark brown, rest of body amber coloured; formed dirty silken tunnels at the roots of the grass; moulted August 20th.

Larva after first moult.—Length, one-sixth of an inch; head and horny plate on second segment dark brown, polished; body pale amber beautifully spotted with sienna-coloured warts, and sparingly set with bristles; moulted September 1st.

Larva after second moult.—Head of a dirty amber colour, marked with brown patches; body amber-coloured, dotted with large brown tubercles.

At this stage I lost my specimens—the frequent disturbances necessary to the observation of their habits proving destructive to them.

The following is a table of the Quebec specimens of this interesting group:

Characteristics of the Group.

Antennæ filiform; labial palpi long and beak-like, porrected; wings in repose folded round the body; fore-wing usually oblong and, in most instances, bluntly terminated, but sometimes, as in *C. minimellus*, with a produced tip. Hind-wings ample.

Larva with sixteen legs; head and thoracic shield usually black or brown; body whitish or straw-coloured, somewhat hairy, and sometimes having glassy tubercles. It forms silken galleries at the roots of grasses.

TABLE OF SPECIES.

A.—*Fore-wings white.*

a. Pure silvery white.
C. perlellus, Scop.

b. Satiny white with several dark brown dots.
C. turbatellus, Walker.

c. Satiny white with a reddish brown dot in the middle of the inner margin, and a reddish brown terminal line.
Argyria nivalis, Drury.

d. Satiny white with an orange band across the wing.
A. auratella, Clemens.

e. Satiny white, with a longitudinal orange stripe bordered with brown and widened into a foot near the hind margin.
C. Girardellus, Clem.

f. White with brown patches and cross-lines.
C. elegans, Clem.

B.—*Fore-wings golden.*

g. Golden with a silvery stripe running throughout and widened at the hind margin.
C. unistriatellus, Packard.

h. Golden with a silvery stripe ending in a point near the sub-terminal line.
C. Leachellus, Zincken.

i. Golden with a very broad silvery stripe ending in a point and having a conspicuous tooth on the inner side.
C. bidens, Zeller.

C.—*Fore-wings ochreous.*

j. Brownish ochreous, with a short, broad and pointed, silvery dash followed by a silvery stroke.
C. alboclavellus, Zeller.

k. Pale ochreous, with a silvery dash divided by a yellow streak.
C. agitatellus, Clemens.

l. Ochreous, with two silvery parallel streaks, the second longer than the first.
C. laqueatellus, Clemens.

m. Pale ochreous, with brown lines and an angulated silvery line bordered with brown near the hind margin.
C. hortuellus, Hübner.

n. Pale ochreous, with fuscous longitudinal lines, and two fuscous transverse curved lines.
C. ruricolellus, Zeller.

o. Pale brownish ochreous with brown lines and two darker brown transverse curved lines.
C. trisectus, Walker.

p. Reddish ochreous with two wavy, somewhat indistinct cross-lines.
C. luteolellus, Clemens.

q. Brownish ochreous with numerous brown streaks.
C. vulgivagellus, Clemens.

D.—*Fore-wings brown.*

r. Glossy reddish brown, with a broad silvery stripe divided into three parts of diminishing length.
C, myellus, Hübner.

s. Dark brown with white markings and black spots.
C. Labradoriensis, Christoph.

E.—*Fore-wings brownish lilac.*

t. Brownish lilac (fugacious) with stripe and other markings white.
C. minimellus, Robs.

Note.—*A. nivalis* is taken at Sherbrooke ; *A. auratella* and *C. laqueatellus*, in the Island of Montreal ; *C. Labradoriensis* and *C. minimellus* at Bergerville, *C. myellus* at Levis.

The foregoing information as to the times of appearance, habits, etc., of the different species of the grass eating larvæ will have prepared the way for this declaration :

THE VERY BEST PREVENTIVE TO INJURY FROM THE LEPIDOPTEROUS PESTS OF THE MEADOW AND THE LAWN IS THE USE OF THE IRON ROLLER.

The best form of roller for field use is the toothed roller formed in sections. This should be passed over the meadows in spring when the grass begins to shoot, and, if possible, at night, for then both the hibernated and the newly-hatched larvæ will have left their retreats and be at work.

Again the roller should be used after the hay-crop has been taken from the fields, for it will then kill such larvæ and pupæ as have been shaken into the under-growth.

Of course in the use of the roller as in other things, judgment needs to be exercised. *It would not do to pass it over heavy clay-lands in wet weather.*

When an assault of the Army-worm upon standing crops is anticipated, a deep furrow should be run around the meadow. This would disconcert and entrap the foe ; and a suitable log attached by a chain to a whiffle-tree should be in readiness, to draw along the trench, as often as may be necessary, for the purpose of crushing the assailants.

The use of Paris green about the meadows and pasture lands cannot—under ordinary circumstances—be recommended. It is far too dangerous.

RARE CAPTURES DURING THE SEASON OF 1896.

By Arthur Gibson, Toronto.

It is my intention here to give the benefit, if any, of a few notes I made, and to briefly describe some of the rarer captures and observations in Lepidoptera, which have personally come under my notice during the collecting season just closed.

The present year has been a most remarkable one for the appearance and capture of interesting and rare specimens of Lepidoptera, in and about the neighborhood of Toronto. Butterflies which have never been recorded as having been taken in this part of Ontario, previous to this year, have been collected in considerable numbers during the past summer, while others which were seldom seen on the wing here have been observed and taken again and again. It is something very unusual for this locality to see so many strangers in the butterfly line, as have paid a visit to Toronto throughout last summer. Whether we shall see the same insects here again next year remains to be seen.

The very first specimen which I met with this last season proved to be a good one, and one which I was exceedingly pleased to get. While out on Saturday afternoon, the 11th April, getting some larvæ of *Arzama obliquata*, I took my first specimen of *Brephos infans*. This beautiful moth I found lying in a small pool of water, where the ice had

melted, close to the bank leading down to the marsh. It was a perfect specimen and I presume had probably just emerged from the pupa, and fallen into the water, where it had ended its short existence.

Argynnis Atlantis,—This butterfly was very common at the Forks of the Credit, on the 1st July, especially on the milk weed, where it could have been taken in any numbers.

Argynnis Bellona.—Appeared to be fairly common at Lorne Park. Took two specimens on the 11th July. Saw several more.

Argynnis Myrina.—To me this insect was very rare this last summer. Only saw one specimen during the whole season, and that I took in the early part of the summer.

Libythea Bachmani.—This very pretty butterfly, Fig. 90, so easily recognized by its long palpi and angled forewings is seldom met with in Canada. I had the pleasure of taking a perfect specimen at Caesarea, Lake Scugog, on the 12th August last. The only previous Canadian captures of this insect, which have been recorded up to August, of this year, have been made at Toronto, Port Stanley, London and Hamilton.

Fig. 90.

Chrysophanus Thoe.—(Fig. 91 the male; Fig. 92 the female.) Although this insect has often been met with in Toronto, I have never taken it here. While away on my holidays, I took my first specimen at Caesarea, on the 12th August. Only saw the one specimen.

Fig. 91.

Fig. 92.

Pieris Napi—Summer form *Oleracea-æstiva*.—This butterfly was very common at the Forks of the Credit, on the 1st July. I could have taken any number of specimens but confined myself to about 30. I also took this insect at Caesarea, Ont., on the 12th August, where it also appeared to be fairly common. I might add that I took one specimen at Lorne Park, on the 11th July.

Meganostoma Caesonia.—(Fig 93) As has been previously mentioned this insect made its first appearance in this neighborhood during the past season, and was fairly common. The first time I noticed it was on the 13th June, when I took three specimens, and also observed it several times later in the same month, and on the first of July at the Forks of the Credit.

Fig. 93.

Papilio Ajax.—While strolling through High Park, on the afternoon of the 14th June, I observed, to me, the first living representative of this Papilio flying very slowly over some small bushes. On June 20th I succeeded in taking a worn specimen and on the 23rd of the same month saw another specimen which looked to be perfect, but as I did not have any appliances handy, did not take it. I also observed this butterfly on the 1st and 11th July.

Papilio Philenor.—(Fig. 94.) I should not like to say for sure, but I am pretty well satisfied that I saw a specimen of this butterfly in High Park, on the 20th June. Gave chase to it but to no effect. I do not know whether this Papilio has ever been taken in Toronto or not.

Fig. 94.

Catocala cerogama.—This was one of our commonest Catocalas here this year. One night alone over twenty specimens were taken. It is usually a rather uncommon moth, and of late years has not been met with very often.

Catocala ilia —This beautiful moth was quite plentiful at "sugar" during the past season. I took my first specimen on the 20th July and also secured it several times later.

Catocala neogama.—I took one specimen of this insect on the 3rd August. This is considered to be a rather rare Catocala in this locality.

Catocala retecta.—The black underwings are always eagerly sought after. Several *retectas* were taken here this year. I took my first one on the 24th August.

Catocalas were unusually early this year, most of them being taken in July and August, while in other years I have always taken them towards the end of August and beginning of September.

THE BUTTERFLIES OF THE EASTERN PROVINCES OF CANADA.

By Rev. C. J. S. Bethune, Port Hope, Ont.

In our 25th Annual Report for 1894, pages 29-44, I gave a list of the Butterflies of the Eastern Provinces of Canada, so far as known to me, with localities and other observations. So many interesting records and rare captures have been made since its publication, in addition to those given in the preceding paper by Mr. Arthur Gibson, that it seems desirable to publish them here. For convenience of reference, I prefix to the name of the species the number given in the 1894 list.

1. Danais Archippus, *Fabr.*—Halifax, N. S., rare: Mr. Harry Piers (Proc. Nova Scotia Institute of Natural Science, vol. ix., part I., page xix.)

2. EUPTOIETA CLAUDIA, *Cram.*—This rare butterfly (Fig. 95) was taken in High Park, Toronto, by Mr. Arthur Gibson, in July, 1893.

FIG. 95.

3. ARGYNNIS CYBELE, *Fabr.*—Taken at Sudbury (J. D. Evans); Orillia, common June 16 to August 31 (C. E. Grant). Miss Eaton mentions its capture at Truro, N. S., but Mr. Piers considers that there is some doubt about its identification. (Proc. N. S. Institute—*loc cit*).

4. ARGYNNIS APHRODITE, *Fabr.*—Orillia, June 23 to August (C. E. Grant); Halifax, N. S., abundant (H. Piers)

5. ARGYNNIS ATLANTIS, *Edw.*—This northern species has greatly extended its range and is now recorded from Orillia, common June 4 to August (C. E. Grant); Toronto and Port Credit, June, July, and August, 1896 (C. T. Hills); London, Sarnia, and Windsor, June and July, 1895 (J. A. Moffat); Truro, N. S., very common (Miss Eaton).

8. ARGYNNIS MYRINA, *Cram.*—Orillia, common, two broods, June and August, C. E. Grant); Truro, N. S., (Miss Eaton); Halifax (H. Piers).

9. ARGYNNIS CHARICLEA, *Ochs.*—"Ranges from Labrador, Hudson Bay and Gulf of St. Lawrence on the east to probably about lat. 51′ 25° on the Pacific Coast, nowhere extending into the United States." (F. M. Webster, Can. Ent. xxvi. 119.)

10. ARGYNNIS FREIJA, *Thunb.*—"Alaska to Labrador and westward to the Rocky Mountains, which range it follows southward to Colorado, about lat. 39°." (F. N. Webster); Calgary (Wolley Dod).

118. ARGYNNIS IDALIA, *Drury.*—This lovely addition to the list of Canadian Butterflies was taken at Windsor, Ontario, last year, by Mr. W. S. Cody, who kindly presented a specimen to the Society's cabinet. St. John, N. B. (H. E. Goold).

13. MELITÆA PHAETON *Drury*—Very rare at Truro, N. S. (Miss Eaton); Halifax, (H. Piers).

15. PHYCIODES NYCTEIS, *Doubl-Hew.*—Orillia, fairly common in June (C. E. Grant); Port Hope, second week in June, 1896. Fig. 96.

17. PHYCIODES BATESII, *Reak.*—Mr. C. E. Grant has taken one specimen of this rare butterfly in July, at Orillia, Ont.

18. PHYCIODES THAROS, *Drury*.—Orillia, common May 24th to July, (C. E. Grant); Truro, N. S. Miss Eaton); Halifax; "very common throughout the Eastern Provinces" (H. Piers).

FIG. 96.

19. GRAPTA INTERROGATIONIS, *Fabr.*—Has usually been considered a rare butterfly in the Province of Quebec, but this year it has been found in great abundance, the larvæ feeding on elm, in the neighbourhood of Montreal. The form *Umbrosa* was abundant at Port Hope in May and June, and *Fabricii* was taken July 29, and as late as November 16, 1896.

20. GRAPTA COMMA, *Harr.*—Sudbury (J. D. Evans); both forms fairly common at Orillia, (C. E Grant).

22. GRAPTA FAUNUS, *Edw.*—Sudbury (J. D. Evans); Orillia, rare (C. E. Grant); Truro, N. S. (Miss Eaton).

23. GRAPTA PROGNE, *Cram.*—Orillia (C. E. Grant); Truro, N. S., not common (Miss Eaton).

24. GRAPTA GRACILIS, *Grote and Rob.*—Orillia, two specimens in July (C. E. Grant.

25. GRAPTA J. ALBUM, *Boisd.-Lec.*—Sudbury (J. D. Evans); Orillia, common in September (C. E. Grant); Truro, N. S., very rare Miss Eaton).

26. VANESSA ANTIOPA, *Linn.*—Truro, N. S. (Miss Eaton).

27. VANESSA MILBERTI, *Godt.*—Sudbury and Orillia, Ont.; Truro, N. S.

28. PYRAMEIS ATALANTA, *Linn.*—Sudbury and Orillia, Ont.; Halifax, common (H. Piers).

30. PYRAMEIS HUNTERA, *Fabr.*—Orillia (C. E. Grant); Halifax, occasionally abundant (H. Piers).

31. JUNONIA CÆNIA, *Hubn*—Don River Valley Toronto, May 23, 1896 (C. T. Hills); two specimens at Toronto in 1895 (C. H. Tyris).

32. LIMENITIS ARTHEMIS, *Drury.*—Sudbury and Orillia, Ont.; Truro, N. S.

34. LIMENITIS URSULA, *Fabr.*—Fig. 97.—Taken at Niagara Falls, Ont., June 25, 1895, and at Port Credit by Mr. C. T. Hills.

35. LIMENITIS DISIPPUS, *Godt.*—Orillia, second brood in July and August in low lands (C. E. Grant); Truro N. S. (Miss Eaton).

36 DEBIS PORTLANDIA, *Fabr.*—Sudbury (J. D. Evans); two specimens were taken at Matchedash Bay, near Coldwater, County of Simcoe, Ont., August, 1883 (C. E. Grant). Fig. 98.

FIG. 97.

FIG. 98.

37. NEONYMPHA CANTHUS, *Boisd.-Lec.*—Sudbury; Orillia, common in low meadows in July (C. E. Grant); Truro, N. S.; and Lower Stewiacke, N. S. (H. Piers).

38. NEONYMPHA EURYTRIS, *Fabr.*—Orillia, common in open woods in June (C. E. Grant).

42. SATYRUS ALOPE, *Fabr.*—Niagara Falls, Ont., July 14, 1896 (A. Gibson); Truro, N. S., rare (Miss Eaton).

45 LIBYTHEA BACHMANI, *Kirtl.*—Taken in Toronto in 1895, and June 7, 1896, by Mr. McDonagh. Fig. 90.

46. THECLA ACADICA, *Edw.*—Orillia, usually rare, but very abundant in July, 1896, when forty specimens were taken by Mr. Grant; Toronto, June and July (C. T. Hills).

48. THECLA EDWARDSII, *Saund.*—Toronto, June and July (C. T. Hills).

49. THECLA CALANUS, *Hubn.*—Sudbury (J. D. Evans); Orillia, rare, taken in July (C. E. Grant

50 THECLA ONTARIO, *Edw*—A specimen of this extremely rare butterfly was taken near Grimbsy on the 24th of June, 1894, by Mr. Wm. Metcalfe of Port Hope. The only specimen previously known was taken twenty-six years before at Port Stanley by Mr. E. Baynes Reed.

51. THECLA STRIGOSA, *Harr.*—This rare butterfly, Fig. 99, was taken at Orillia in July by Mr. Grant, and at Toronto in June and July by Mr. C. T. Hills.

FIG. 99.

119. THECLA HUMULI, *Harr.*—This is another addition to the list of Canadian butterflies; it was taken at Sudbury by Mr. Evans.

58. FENISECA TARQUINIUS, *Fabr.*—Orillia, moderately common in one locality (C. E. Grant).

63. CHRYSOPHANUS HYPOPHLÆAS, *Boisd.*—Orillia (Grant); Truro, N. S., very common (Miss Eaton).

67. LYCÆNA PSEUDARGIOLUS, *Boisd.-Lec.*—Orillia; the form *Lucia* is very common in April and May; *Neglecta* is not so abundant in July and August (C. E. Grant); Truro, N. S., rare (Miss Eaton); Halifax, "abundant in the spring and familiar to trout fishermen under the common name of 'Jenny Lind'" (H. Piers).

68. LYCÆNA COMYNTAS, *Godt.*—Toronto in June (C. T. Hills).

69. PIERIS PROTODICE, *Boisd.-Lec.*—Orillia, formerly common; one male was taken in August, 1895 (C. E. Grant

70. PIERIS NAPI, *Esper.*—Orillia, the spring and summer forms are common; *Virginiensis* has also been taken (C. E. Grant); Truro. N. S., not very common (Miss Eaton).

71. COLIAS CAESONIA, *Stoll.*—Fig. 93.—The sudden appearance of this butterfly in considerable numbers in several localities in Ontario during the summer of 1896, is very remarkable. It was taken at Orillia by Mr. James Walker on July 13, and by Mr. Grant from June 6 to July 13; at Toronto by Messrs. C. T. Hills, C. H. Tyris and A. Gibson from June 11 to the end of the month; Little York, near Toronto, June 14. It was also taken at Cartwright, Manitoba. on June 19 by Mr. E. Firmstone Heath.

72. COLIAS EURYTHEME, *Boisd.*—Sudbury (J. D. Evans); Orillia, common in 1872, not seen since (C. E. Grant).

78. TERIAS MEXICANA, *Boisd.*—No further record, but a cut is given, Fig. 100, to aid in its identification should it again make its appearance in south-western Ontario.

FIG. 100.

79. PAPILIO AJAX, *Linn.*—Port Hope at the end of May and on June 18, 1896; Toronto, four specimens during June (C. T. Hills), in addition to those observed by Mr. Gibson.

81. PAPILIO CRESPHONTES, *Cram.*—Taken at Orillia by Mr. Grant. In 1894 we gave a figure of this splendid butterfly and are now able to present pictures of the caterpillar, Fig. 101, and the chrysalis, Fig. 102.

85. PAPILIO PHILENOR, *Linn.*—A specimen was taken at Port Hope, on the 5th of August, 1896; this is the first time it has been observed east of Toronto in this Province. Fig. 94.

87. ANCYLOXYPHA NUMITOR, *Fabr.*—Humber River, near Toronto, and at Port Credit, in June, July and August (C. T. Hills).

89. PAMPHILA ZABULON, *Boisd.-Lec.*—The form *Hobomok* was abundant in sunny places in the woods near Port Hope during the first and second weeks in June, 1896; both forms common at Orillia in May and June (C. E. Grant).

94. PAMPHILA MYSTIC, *Scud.*—Orillia, common in June and August, two broods (C. E Grant); Truro, N. S. (Miss Eaton).

95. Pamphila Cernes, *Boisd.-Lec.*—Sudbury (Evans); Orillia (Grant); Truro, N. S. (Miss Eaton).

97. Pamphila Metacomet, *Harris.*—Toronto in July (C. T. Hills); Orillia, scarce, in July (C. E. Grant)

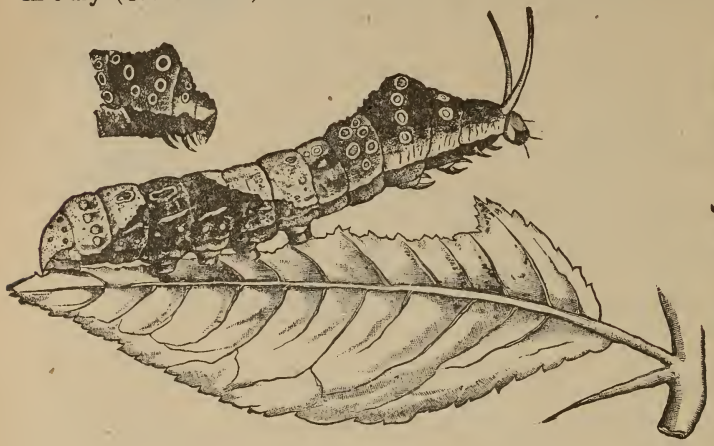

Fig. 101.

Fig. 102.

104. Pyrgus Tessellata, *Scud.*—This rare butterfly, Fig. 103, which has only been recorded in Canada as having been taken in Essex County, Ontario, many years ago, was taken in the early part of October, 1895, by Mr. Anderson, at London, Ont.

Fi 103

106.—Nisoniades Brizo, *Boisd.-Lec.*—Orillia, scarce (C. E. Grant).

107. Nisoniades Icelus, *Lint.*—Orillia, not uncommon in May, June and July (C. E. Grant).

108. Nisoniades Lucilius, *Lint.*—Orillia, scarce (C. E. Grant).

109. Nisoniades Juvenalis, *Fabr.*—Sudbury (J. D. Evans); Orillia, not uncommon in May and June (C. E. Grant).

112. Pholisora Catullus, *Fabr.*—Orillia, rare, June (C. E. Grant).

114. Eudamus Pylades, *Scud.*—Port Hope, abundant in sunny places in the woods during the first two weeks of June, 1896; Orillia, abundant at the end of May and in June (C. E. Grant).

OBITUARY.

John M. Denton.

It is with profound regret that we record the death of our old friend and highly esteemed colleague Mr. John M. Denton, of London, Ontario, who was one of the early members of the Entomological Society and always took a very lively interest in its welfare. For some months he had been in poor health owing to an affection of the liver, but was able to attend his place of business from time to time and to take part in the proceedings of our annual meeting in November 1895, when many of us saw him for the last time. In January, his illness assumed a more acute form and confined him to the house. On Tuesday, March 24th, he was seized with paralysis and before midnight passed peacefully away.

Mr. Denton was born in Northampton, England, on the 19th of September, 1829. His father was a farmer by occupation, and he was consequently brought up in the country amidst rural scenes and learnt there to love and observe the beauties of nature. At the age of fourteen he was apprenticed to a woollen draper and tailor, and spent seven years in thoroughly learning the trade and becoming proficient in all its details. For a few years he was engaged in business on his own account, and in 1855 married Miss Ann Walker, of Somersetshire, England, who survives him. He then emigrated to Canada and settled in London and at once resumed his occupation as a tailor, having but little to begin upon, except a hopeful heart and a thoroughly practical English training. By patient industry, unfailing courtesy and unswerving integrity, he built up by degrees a most successful business as a merchant tailor, and won the respect and esteem of the whole community.

Living on a farm in his boyhood and apprenticed at so early an age, he had but little opportunity of acquiring a literary education, but by constant application and careful reading he overcame these disadvantages, and attained a more than ordinary knowledge of the subjects that interested him. Foremost among these was Entomology, which he studied especially in its economic aspects as affecting live stock, fruit trees, garden and field crops. He became an authority on these topics and was frequently called upon to address meetings of farmers and fruit growers and give them the benefit of his knowledge and experience. His love of the farm continued throughout his life and he devoted much of the time that he could spare from business to the cultivation of a fruit farm a few miles from London. He was no mean authority upon horses and cattle and had a considerable knowledge of their diseases and most satisfactory treatment. He was also an adept with the microscope and took great delight in searching into the hidden beauties of nature.

When the London branch of the Entomological Society was formed in July, 1864, he was one of the original members, and took a most active interest in it and the parent Society to the close of his life. He was elected Vice-President of the London branch in 1872, and President in 1878 and several years following. In 1871, he became a member of the Council of the parent Society and continued to hold office for five and twenty years; in 1892 he was elected Vice-President, but he would never allow himself to be nominated for the Presidency, though urged to do so more than once. He was also an active member of the Ontario Fruit Growers' Association and gave much assistance to its work.

He was a man of deep religious feelings and of earnest but unobtrusive piety. Though a leader of the Plymouth Brethren, he never obtruded his views upon those who differed from him. The writer knew him well for a great number of years, and during his visits to London often enjoyed his hospitality, but never did he hear a word fall from his lips that could wound in the slightest degree the susceptibilities of those who did not accept the theological opinions that were so dear to him. He was a good, honest, sterling man, whom all respected and whom his friends loved; kind, charitable and generous; courteous in manner, most hospitable in his home, above reproach in business; a man who is a distinct loss to the city in which he lived, and whose death creates a blank in the hearts of his friends which can never in this life be filled. To his childless, sorrowing widow we tender our deepest, sincerest sympathy.

C. J. S. B.

Captain J. Gamble Geddes.

It is our painful duty to record the loss of another active member of the Entomological Society of Ontario. A 2 o'clock on Good Friday morning, April the 3rd, Captain J. Gamble Geddes died after a few days' illness brought on by a severe cold. He was born in Montreal in 1850 and educated there. When a young man he entered the service of the Molsons Bank and was for some time attached to the office in London. He at once joined the Society and became an enthusiastic member. In 1874 he was elected Secretary-Treasurer of the London Branch; in 1875 Vice-President; and in 1876 Presi-

dent. He left London on his appointment as Manager of the agency of Molsons Bank at Millbrook. Here living in the country he devoted most of his leisure time to the collection and study of insects, applying himself especially to the Lepidoptera. In 1880 he left the bank and was appointed aide-de camp and private secretary to the Hon. John Beverley Robinson during his term of office as Lieutenant-Governor of Ontario. Being fond of society, of handsome presence and devoted to music, he became a great favourite among the social circles of Toronto, among whom much of his time was accordingly spent. He did not, however, abandon the pursuit of Entomology, but succeeded by correspondence and exchange, in addition to the captures of his own net, in forming a large and valuable collection of butterflies from all parts of the world. This he subsequently sold to the Dominion Government and it now forms the nucleus of the collection in the Geological Museum at Ottawa. He made expeditions in 1883 and 1884 to Manitoba and the Northwest Territories as far as the Rocky Mountains in quest of butterflies and added much to the knowledge of their geographical distribution and habits. On several occasions he visited England, and spent some time in Germany, and also in Bermuda. Wherever he went he made the acquaintance of the leading Entomologists and added to his stock of knowledge.

His first contribution to the *Canadian Entomologist* was in 1874, when he wrote No. 14 of a series of articles on "Some Common Insects"—"The Common Cockchafer," C. E. vol. vi. p. 67. His subsequent papers were the following: "List of Diurnal Lepidoptera collected in the Northwest Territories and the Rocky Mountains in 1883," C. E. xv., 221; xvi., 56, 224; xvii, 120; one hundred and twenty-six species were enumerated.

"Euptoieta Claudia," C. F. xvii., 60 (1885).

"Notes on three small collections of Diurnal Lepidoptera made in 1886." (These were made in Newfoundland, the Kamanistiquia River, Lake Superior, and Hudson Straits.) C. E. xviii., 204.

"Some notes on the genera Colias and Argynnis whilst alive in the imago state," C. E. xix., 166 and 230 (1887).

"Notes for collectors visiting the Prairies and Rocky Mountains," C. E. xxi., 57 (1889).

"Colias Chione," C. E. xxi, 59.

He also contributed the following articles to the Annual Reports of the Society:—

"Some remarkable captures in Ontario," 18th Report, 1877, p. 21.

"On some of the collections in England and the German Empire," 22nd Report, 1891, p. 31.

"Insects collected in Bermuda during the winter of 1894," 25th Report, 1894, p. 25.

In addition to his love for Entomology, he took a great interest in philatelics, and formed a large and valuable collection of postage stamps. He was an accomplished musician and usually sang in the choir of the church that he attended; he was also a member of the Philharmonic Society of Toronto. He belonged to the Masonic Order, in politics was a strong Conservative, and in religion a member of the Church of England. His wife, who was a daughter of the late Edward C. Jones, of Toronto, died a little more than a year ago. The untimely death of Captain Geddes was no doubt hastened by her loss. They have left two little orphan girls, aged three and five years respectively.

The writer, who knew him intimately from his boyhood, deeply deplores his loss, and his grief is shared in by a very large circle of relatives and friends.

C. J. S. B.

Miss G. E. Ormerod.

It is with deep regret that we record the death of Miss Georgiana Elizabeth Ormerod, of Torrington House, St. Alban's England, the elder sister of Miss Eleanor A. Ormerod, whose name as a distinguished Entomologist is known throughout the scientific world. After several months' of patiently borne illness, she passed away on the 19th of August

last, full of piety and good works, and justly esteemed and loved by all who knew her. She and her sister were each other's constant companions and fellow workers, and each sought the other's counsel and aid in carrying out any plan of work in which she was engaged. Miss G. E. Ormerod's special studies were botany and conchology, and in the latter department she formed a large and valuable collection of shells which she presented a few years ago, to the Natural History Museum at Huddersfield. She was highly gifted as a linguist, and acquired an excellent knowledge of French, Italian, Spanish and German, and was thus enabled to be of the greatest assistance to her sister in correspondence and the translation of foreign works of science. She is most widely known, however, by her remarkable talents as an artist, which were employed in the illustration of her sister's works, and in the production of a splendid series of diagrams in which are depicted a large number of the most important injurious insects in all their life-stages.

In addition to her scientific and artistic work she devoted much of her time and means to benevolent objects, and carried out for many years at her own expense a system of distributing books of an entertaining and instructive character amongst the working classes.

Women of such a type are rare, and we cannot but deeply deplore the loss of this eminent Christian lady, who died at an advanced age, full of good works, performed in a most unobtrusive manner; richly endowed with intellectual and artistic talents which she largely used for the benefit of others; always happy and cheerful in her daily domestic life; kind, hospitable and sympathetic: ready to help all who deserved her aid, and to give wise counsels to those who sought them from her.

To her sister—her life-long colleague—the loss is beyond what words can express. We can only venture to offer to her our heart-felt sympathy and our earnest wish that she may have grace and strength to endure so heavy a blow.

C. J. S. B.

ENTOMOLOGICAL LITERATURE.

The Gypsy Moth.—A report of the work of destroying the insect in the Commonwealth of Massachusetts, together with an account of its history and habits both in Massachusetts and Europe. By E. H. Forbush and C. H. Fernald.

This report, a handsome volume of nearly 600 pages, well printed and most copiously illustrated with chromolithographs, photogravures and wood cuts, gives a full account of the introduction of the now notorious "Gypsy Moth" into America by Leopold Trouvelot in 1868 or 1869, traces its history, and records the efforts which have been made to exterminate it by the State of Massachusetts up to the end of 1895. The spread of this insect for the first ten years was remarkably slow in the light of what we now know of its capabilities for harm. During that period it was not noticed by anyone but the introducer. The first extensive outbreak was in 1889, but for ten years before that it had given great annoyance to the people living in the part of the town of Medford, where it was first introduced. It had also spread and had gained a foothold in thirty townships without attracting public attention. Since that time its history is well known. In 1890 the first Gypsy Moth Commission was appointed and the work of fighting the pest was inaugurated. In February of the next year this commission was removed and another one substituted. On 12th of March Mr. E. H. Forbush, the present very efficient "Director of field work," was appointed, and on 18th June Prof. C. H. Fernald began his labors as entomological adviser. Since that time the work has been pushed on with great energy and the present valuable report is an outcome of the combined efforts of a practical, energetic manager and a careful, scientific entomologist. The two parts of this report prepared by the above named officers are quite distinct and form together a very complete treatise, not only upon the Gypsy moth, but upon the general principles which it is necessary to study when combatting any injurious insect. This carefully prepared report, therefore, cannot but be for a long time an indispensable book of reference for economic entomologists.

There are in this volume many things which will attract the attention of entomologists. Indeed, it is so full and there are so many different subjects treated of, that even to give the titles would take more space than is at my disposal. The first thing which will be noticed is the adoption of the generic name *Porthetria*. Articles of particular note deal with the studies made as to the methods of distribution of the Gypsy moth and the measures practised for the destruction of the insect in its different stages; spraying apparatus, and particularly the care of spraying machinery; methods of pruning, and some charming observations upon insect-eating birds.

The scientific work contained in Professor Fernald's report is of great value and contains a record of most painstaking and patient work. Probably one of the most interesting sections is that which deals with Natural Enemies, in which most excellent work has been done. Prof. Fernald has been aided in this work by efficient assistants, and the whole information so gained has been pieced together by a master hand.

With regard to spraying, some surprising results have been obtained. In the first place the caterpillar of the Gypsy moth seems to be little affected by applications of Paris green when applied of the strength ordinarily used for other mandibulate insects. Mr. Forbush says: "It became evident before the end of the season of 1891 that spraying, while reducing the numbers of the moth, could not be relied upon as a means of extermination, for many caterpillars survived its effects."

The following conclusion on page 139 will show entomologists that the matter of controlling mandibulate insects, by means of active poisons, is still a fertile field for careful work, in which useful and laurel-bearing results are still to be reaped:

"Every effort was made during the spraying season to determine why the results of spraying were not uniform and satisfactory. The feeding caterpillars were watched day and night by many observers. The spraying was most carefully superintended and the conclusion finally arrived at was that, under ordinary conditions, spraying with Paris green for the Gypsy moth was ineffective and unsatisfactory."

Paris green was on the whole the most fatal insecticide, and when used in the proportion of one pound to 150 gals. of water did not burn foliage, but with larger proportions did considerable harm. The injury developed so rapidly that within a short time the leaves were all killed and the surviving larvæ had to go elsewhere to feed. "Therefore, a strong Paris green mixture had little better effect than a weak one. Lime was then used with the Paris green with a view of neutralizing the burning, but considerable injury to the foliage still continued."

Probably one of the most remarkable facts discovered by the entomologists is related by Professor Fernald on page 476, where he says: "One interesting result obtained from the analysis of the different stages of the Gypsy moth, made in 1893 and 1894, is that pupæ and imagoes from caterpillars which have been reared on leaves sprayed with Paris green or arsenate of lead, may contain arsenic in recognizable quantities. Several pupæ and a few female imagoes obtained under these conditions, when subjected to chemical analysis gave ample evidence of the presence of arsenic in their bodies. This shows that the presence of arsenic in the pupa may not materially interfere with the processes involved in the development of the imago. Since, as has been repeatedly demonstrated, moths reared from poisoned larvæ are capable of reproduction, it is also evident that the arsenic contained in their bodies does not injure the reproductive function."

With reference to the amount of arsenic which could be consumed by some of these caterpillars, and yet leave them "normally active and healthy," it was found that some of them had in their bodies in proportion to their weight, an amount equivalent to $12\frac{1}{2}$ times the fatal dose for an adult human being, in proportion to the weight of the latter.

The work of the Gypsy Moth Committee has been criticized, examined and studied by practical men who were entomolgists and others who were not. As far as I can learn, the general verdict is that excellent work, and, under the circumstances, remarkably so, has been done. The insect is not exterminated, it is true; but there seems every reason to hope, judging from what has been done and the behaviour of the species in other countries

where it was once alarmingly abundant, that this is possible, if money is supplied and if it is given at the time when it can be made use of to the best advantage. On pages 38 to 93 of the report will be found an instructive account of the constant efforts of the Committee to get funds to carry on the work properly, and year after year it was the same story of reduced, and what was almost worse, delayed appropriations, resulting in the necessity of modifying the whole plan of work arranged for the year, so that instead of making vigorous efforts for the extermination of the insect, and fighting it at the time this could be most effectively done—early in the season, when the caterpillars were small —all that could be done was to try and prevent the further spread of the enemy from the localities known to be infested. The appropriations which have been made for this work are considerable, about $525,000 up to the present time, and this amount would certainly have produced far better results, could the Committee have obtained the grants at the time they required them, so that they could have begun the work early in the season and continued employing, from year to year, those assistants who had been taught, at an expense of much time and trouble, what was required of them. J. F.

REPORT OF OBSERVATIONS OF INJURIOUS INSECTS AND COMMON FARM PESTS DURING THE YEAR 1895, WITH METHODS OF PREVENTION AND REMEDY. Nineteenth Report, by Eleanor A. Ormerod, F. R. Met. Soc., etc.

This splendid report fully sustains the high standard of excellence which has characterized Miss Ormerod's previous publications. The preface shows that the unusual and prolonged low temperature of the winter of 1894-95 had apparently but little affected the insects which it might be supposed to destroy.

The following pests are treated of in separate chapters: Apple, *Smerinthus ocellatus;* bean, *Bruchus rufimanus* and *B. fabæ*; cabbage, *Ceutorhynchus sulcicollis*; corn and grass, *Charœas graminis, Cetonia aurata, Phyllopertha horticola, Melolontha vulgaris, Rhizotrogus solstitialis, Tipula muculosa* and *Oscinis frit*; gooseberry, *Bryobia prætiosa, B ribis* and *Nematus ribesii*; mangolds, *Aphis rumicis, Silpha opaca* and *Atomaria linearis*; orchard caterpillars, *Cheimatobia brumata*; pine, *Astynomus ædilis* and *Retinia buoliana*; plum, *Scolytus rugulosus*; strawberry, *Harpalus ruficornis, Pterostichus madidus* and *P. vulgaris*; turnip, *Helophorus rugosus.*

The ravages of the bean weevil appear to have been serious, and those of the ground beetles, upon the strawberry, have been more extensive than in previous years. Ninety-three pages are occupied with the discussion of the above mentioned insects, while fifty are allotted to "Flies injurious to horses, cattle," etc. These chapters are exceedingly interesting, and several species of Hippoboscidæ, Tabanidæ, and Œstridæ, which are very annoying and injurious to domestic animals, are fully and clearly discussed. In connection with the account of the attacks of the Forest Fly, *Hippobosca equina*, are given two magnificent plates showing upper and side views of the foot of this fly, the tarsi of which are so modified as to enable it to secure a most firm grip on the hairs of the animal upon which it alights. The report concludes with a chapter on Deer and Dog Ticks, very troublesome mites belonging to the Ixodidæ. W. H. H.

BRITISH BUTTERFLIES, by J. W. Tutt, F.E.S., London: George Gill & Sons, 1896. Pp. 469. (Price 5s.)

It is only a few months since we spoke in terms of commendation of Mr. Tutt's Manual of the British Moths, and now we have before us an even better work on the butterflies by the same industrious author. About one-fourth of the book is taken up with the general subject, presenting a series of chapters on the four life stages of butterflies, their variation and its causes, hibernation and æstivation, classification, collecting, arranging and preserving specimens, and the inflation of larvæ These are written in the author's pleasant, easy style, with which his previous works have made us familiar, and convey much information of interest to butterfly-hunters everywhere. We are glad to observe that he insists very strongly upon the importance of labelling specimens with the place and date of capture, though the English mode of using short pins and setting the specimens low down makes this a matter of difficulty.

The descriptive portion of the work is excellent and much more complete than that of any manual of British butterflies that we have met with. In the case of each species there are given the English and scientific names, reference to the plate where it is figured, synonymy and bibliography, a concise description of the imago, a paragraph on "variation" in which are mentioned any known aberrations, forms of varieties, as well as sexual distinctions, descriptions of the egg, larva, pupa, notes on the time of appearance, habitat and geographical distribution. Thus it will be seen that proper regard is paid to the whole life history of the insect and that the author does not confine his attention to the imago alone. The plates (uncolored) on which each species is depicted are admirable, and should enable any collector to identify his specimens without difficulty; there are also a considerable number of wood cuts throughout the text.

In the arrangement of species the author begins with the "lowest"—the Skippers, Hesperidæ—and proceeds upwards to the Satyridæ, among which he strangely places "the Purple Emperor," *Apatura iris*. His classification, a thorny subject which we do not propose to discuss here, may thus be considered fully "up to date."

To our readers in the British Isles and to those who have collections of British butterflies, we heartily commend this excellent manual. We only hope that it may not be very long before we have some hand-book equally good dealing with the butterflies of Canada.—C. J. S. B.

Preliminary Notes on the Orthoptera of Nova Scotia, by Harry Piers. Transactions of the N. S. Institute of Science, vol. ix., 1896.

So little attention is paid to Entomology in the Maritime Provinces that we gladly welcome this contribution to the subject and are much pleased that Mr. Piers intends to devote some years to the study of the order Orthoptera. The paper before us gives some very interesting notes on the habits and range of fourteen common species of cockroaches, crickets and locusts, and describes more at length the ravages committed by *Melanoplus atlanis* on Sable Island, a hundred miles off the coast of Nova Scotia in the Atlantic Ocean.—C. J. S. B.

Insect Life.—A short account of the classification and habits of insects, by F. V. Theobald, M.A., F.E.S.. London: Methuen & Co. Pp. 235. (2s. 6d.)

Under the title of the "University Extension Series" the publishers are issuing a number of books on historical, literary and scientific subjects, which are intended to be both popular and scholarly. We have not seen any of the other works of the series and cannot, therefore, comment upon them, but the book before us seems hardly to come up to the expectations one would naturally form of a manual intended for use in preparation for "University Extension" lectures. The descriptive portion is meagre and will afford a student a very vague idea of the insects belonging to the different orders. It is satisfactory, however, to find in an English publication some attention paid to Economic Entomology and the application of the insecticides, which are in common use here. The book is neatly printed (though we have noticed several misprints in the spelling of names) and is illustrated with over fifty wood cuts.—C. J. S. B.

Critical Review of the Sesiidæ found in America north of Mexico, by William Beutenmüller, pp. 111-148, Bull. Am. Mus. Nat. Hist, VIII., 1896.

The writer of the present brief notice of this excellent paper on the *Sesiidæ* desires to call attention to the very careful work of Beutenmüller on the clear-wings and the necessity for this work which has arisen from the uncritical publications of preceding authors. It appears, for instance, that our *S. lustrans*, a species well distinguished by antennal peculiarities, has been five times the subject of new descriptions by the late Mr. Hy. Edwards, whose species are very properly reduced, as appears from Beutenmüller's studies. The name hitherto used for this species itself must, it seems, give way to *bassiformis*, Walk., described from a type in poor condition. Beutenmuller

is quite correct in calling attention to the particular necessity in this group for good material from which to describe. The want, perhaps, of such material led Mr. Edwards to describe *S. rutilans* six times over. A large number of sexual determinations by Mr. Edwards are corrected by Mr. Beutenmuller, so it seems hardly possible for anyone to have worked with less judgment. The list of the clear-wings in the New York Check List was drawn up, with the rest of the list, by the writer of the present lines, who at the time merely sent the last proof to the late Mr. Hy. Edwards for his revision. Mr. Edwards added, in explanation, the two foot notes on page 12 and signed these, and made one or two changes in his names for genera on page 11. The writer is also responsible for the list of the clear-wings, since he originally wrote the same, and not Mr. Edwards. The explanation is here given, as the list has been erroneously alluded to as the work of Mr. Edwards. In the Philadelphia list the New York list is generally copied, but *lustrans* is wrongly given to Mr. Hy. Edwards, and an implication is conveyed in the preface that Mr. Hy. Edwards was the author of the lists of the clear-wings, which is here corrected. The writer trusts that Mr. Beutennmuller will continue his studies and that lepidopterists generally will help him in every possible manner. It is a matter of great satisfaction that Mr. Beutenmuller's timely work is also of such good quality. The writer would merely reclaim his *Sesia pictipes*, which is also given to Mr. Hy. Edwards, on p. 134, and draw attention to the excellent description of the habits of this species given by the late Dr. Bailey in the pages of the American Entomologist.

A. Radcliffe Grote, A. M.

A List of the Butterflies of Sumatra, with special reference to the species occurring in the north-east of the Island. By L. de Nicéville and Hofrath Dr. L Martin. Calcutta. Reprinted from the Journal of the Asiatic Society of Bengal, 1895.

This list of seven hundred and fifty-six species of butterflies taken in a limited portion only of the great Island of Sumatra, gives one some idea of the wealth of the insect fauna in tropical regions. In a very interesting introduction the authors give a brief description of the Island, which is nearly as large as France and is bisected by the equator, and relate the difficulties that have to be surmounted in the formation of a a collection of its butterflies, which can only be effected by employing natives, who have first to be taught and trained for the purpose. Dr. Martin lived for thirteen years on the Island and has thus been enabled to add very interesting notes on the distribution, scarcity or rarity, habits, season of occurrence, etc., of a large number of species. One may, therefore, open the list anywhere and find not a mere record of names, but highly interesting details regarding the butterflies. As might naturally be expected, the preparatory stages of the majority of the species are as yet unknown.

C. J. S. B.

A List of the Butterflies of Sikhim, by Lionel de Nicéville, F. E. S., etc. Calcutta: from the Gazetteer of Sikhim. Printed at the Bengal Secretariat Press.

Probably no part of the great British Empire of India and its tributary States has been so fully explored by the collectors of butterflies as the country of Sikhim, which includes the famous health resort of Darjeeling, about 7,000 feet above the sea, on the slopes of the Eastern Himalayas. Consequently the author is able to record in this list no less than six hundred and thirty-one species, which he considers a near approach to the maximum number that can be discovered. Certainly it is a goodly number, and one hard to be realized by a dweller in these northern and much less luxuriant regions. And what splendid creatures they are, with their gorgeous colouring and infinite variety of shapes and hues. Nearly fifty species of Papilios alone are recorded, and more than one hundred and fifty Lycænidæ, the greater number of which belong to genera that are entirely unknown to us here.

C. J. S. B.

Monograph of the Bombycine Moths of America North of Mexico, including their transformations and origin of the larval markings and armature. Part I., family 1, Notodontidæ. By Alpheus S. Packard. National Academy of Sciences, Vol. VII., 1895 (received May 11th, 1896); 292 pages, 49 plates, and 10 maps.

Dr. Packard's long promised monograph has at length appeared. The copious text is divided into ten sections: I., Introduction; II., Hints on the mode of evolution of the bristles, spines, and tubercles of Notodontian and other caterpillars; III., On certain points in the external anatomy of Bombycine larvæ; IV., On the incongruence between the larval and adult characters of Notodontians; V., Inheritance of characters acquired during the lifetime of Lepidopterous larvæ; VI., Geographical distribution of the American Notodontidæ; VII., Phylogeny of the Lepidoptera; VIII., Attempt at a new classification of the Lepidoptera; IX., A rational nomenclature of the veins of the wings of insects, especially of the Lepidoptera; X., Systematic revision of the Notodontidæ, with special reference to their transformations.

Most of these have previously appeared as separate articles, as the reader will recall. The life-histories are given as fully as our present knowledge will allow, much of this knowledge being due to Dr. Packard's own labours. The plates illustrating them are beautifully coloured, the early stages highly magnified. These plates must be seen to be appreciated.

A few remarks in criticism of the memoir will not be understood to imply a lack of appreciation of its many valuable features. In general the synoptic tables of subfamilies, genera, and species are poor and uncritical. They are no improvement over those of the author's monograph of Geometridæ, to which the same criticism applies. In all the figures of larvæ the setæ are imperfectly shown, and their number and position are not to be relied upon. I corrected for Dr. Packard a number of the plates in this respect, but the corrections were necessarily made from memory and on general principles, and there is not a figure which has the authority of a careful copy from nature. Even the special figures in the text are often grossly erroneous; *e. g.*, figure 9, on page 63, where the back and side views of the same larva are shown as different. Dr. Packard also fails generally to describe the arrangement of the setæ in the text.

The classification of the Lepidoptera which is used is original with the author. It has been already presented in the *American Naturalist*, where I have had occasion to notice it. In rejecting the classification of Prof. Comstock, the author argues that the frenulum is of small value in classification, because both frenulum and jugum are present in some Jugatæ, and the frenulum is absent in some Frenatæ. While we may admit this argument for what it is worth, it seems that Dr. Packard entirely misses the great cumulative force of the evidence adduced by Prof. Comstock and others for these suborders. Classifications founded on the venation alone [Hampson], the wing scales [Kellogg], and the antennæ [Bodine] give the same suborders. I have also shown that the larval characters do not support Dr. Packard's view. But Dr. Packard gives no weight to larval characters, in spite of the implication in the title.

Harrison G. Dyar.

Missouri Botanical Garden. Seventh Annual Report, 1896.

Very few reports are more eagerly looked for every year by those who are lucky enough to secure copies than Prof. Trelease's report on the Missouri Botanical Garden and the Henry Shaw School of Botany at St. Louis, Mo. This report contains not only the Director's annual statement on the condition of the Garden and its finances, but also valuable monographs on different genera of plants. In the present volume we find the following: I. *The Juglandaceæ of the United States*, by Prof. Trelease; II. *A Study of the Agaves of the United States*, by A. Isabel Mulford, and III. *The Ligulate Wolffias of the United States*, by C. H. Thompson. A feature of all these annual reports is the magnificent illustrations.

In addition to the above, there is the report of a speech delivered at the sixth annual banquet, by President Henry Wade Rogers, of the North-west University, on The Value

of a Study of Botany, and a catalogue of the "Sturtevant Prelinnean Library" the greater part of which was presented to the Botanical Garden by Dr. E. Lewis Sturtevant in 1892.

One very notable omission from the present volume which we much regret is the printing of the Annual Flower Sermon. Last year it was delivered by the Rt. Rev. W. C. Doane, Bishop of Albany.

The first annual event provided for in his will by Henry Shaw, the good man who founded this garden for the enlightenment and happiness of his fellow men, was "The preaching of a sermon on the wisdom and goodness of God, as shown in the growth of flowers, fruits and other productions of the vegetable kingdom.". A lovely poem in prose for the perusal of which by his friends, the writer's copy of the 1893 report is in constant use, is a sermon preached by the Rev. Cameron Mann, from the text "Consider the lilies of the field." This sermon, from a literary standpoint, is charming, and certainly helps to carry out the wise wish of the benevolent founder to inculcate in all a thankful spirit for the many lovely things in the vegetable kingdom which we find strewed with no niggard hand along our walk through life, making our own journey more beautiful and, it is hoped, our friends happier from contact with us.

J. F.

Economic Entomology, for the farmer and fruit grower and for use as a text book in agricultural schools and colleges; by John B. Smith, Sc. D. Philadelphia: J. B. Lippincott Co., 1896. [Price $2.50]

It is rather remarkable, when the self-evident importance of the science of Economic Entomology is considered, that until Prof. Smith issued his excellent manual, which has just appeared under the above title, there was no one American book which a farmer could consult to find the names and proper remedies for the common crop pests which would come regularly before him in a year's working of his land. The author in his long experience first as a member of the staff of the "United States Entomologist at Washington, and subsequently as State Entomologist of New Jersey," has had great opportunities of becoming thoroughly informed on his subject. That he has made the best use of these opportunities, is evidenced by the excellent book which he has now produced. The best way to test anything is to use it. Thus if anyone wishes for information upon anything within the limits of Economic Entomology, the subject of Prof. Smith's book, as, for instance, some one of the regularly occurring insect enemies of crops, *e. g.*, cut-worms, white grubs, canker worms, the Colorado potato beetle, plum curculio or tussock moth, etc., let him turn it up in the index of this work and he will be referred to a clear and concise account of the insect and its habits, together with recommendations as to the best remedies. The identification of the different species is made easy by a profusion of remarkably good illustrations. The whole book, including the index, consists of 481 pages, while the number of illustrations is no less than 483, all of which are unexceptionable if a mental reservation may be allowed as to the three plates of Bumble-bees and Bee flies Nos. 398, 464, and 473, taken evidently from photographs. It seems a pity that these plates should have been included in this work on Economic Entomology. The arrangement of the book, for ease of reference, is well planned and well carried out, the objects the author had in view, as explained in the introduction, being adhered to in a most satisfactory and complete manner. Part I. consists of eight short chapters on the Structure and Classification of insects. Part II. the insect world, which forms the bulk of the book, is a systematic treatment of the various common injurious insects in their natural orders. This portion is particularly well balanced, enough space being devoted to each species treated of to satisfy the inquirer, without, as is sometimes the case, giving undue importance to some at the expense of others. Part III. treats of insecticides, preventive remedies, and machinery. This work cannot fail to prove of great value to the farmer and fruit grower, as well as to the amateur gardener and student of insect life, who will find in it an authoritative book of reference of small size but comprehensive and easy to consult.

J. F.

Household Insects, (U.S. Bulletin No. 4. New Series.)

During the year 1896 several most useful publications were issued from the United States Division of Entomology under the direction of Dr. L. O. Howard. Of particular interest to the general public was Bulletin No. 4, entitled "The Principal Household Insects of the United States." The main part of the volume is prepared by Dr. Howard and his assistant Mr. C. L. Marlatt, and at the end is a chapter by Mr. F. H. Chittenden on "Insects affecting cereals and other dry vegetable foods." To entomologists, who know the literary and scientific work of these gentlemen, it is only necessary to say that this volume is up to, or perhaps even a little above, the usual excellent standard of the papers issued from the U.S. Division of Entomology at Washington. A very few minutes' examination of the different articles in Bulletin 4 will convince anyone of the extreme value of this concise, practical treatise on all the commoner insects which are likely to be found troublesome inside houses. It is almost impossible for one who has made a specialty of entomology to speak in moderate terms of these publications. There is nothing to compare with them published in any other country. When we consider the matter treated of, and the practical way in which it is presented, the manifest care to secure accuracy of statement, the exquisite work of the artist as well as the arrangement and general get-up of the pamphlet, one is tempted to use so many superlatives that any opinion expressed might be thought to be unduly biassed.

A special feature of value in this publication is that it is entirely made up of original American observations, most of them prosecuted in the Division of Entomology, and, as is pointed out by Dr. Howard in the introduction, the very curious but not unexpected condition of affairs was shown in the preparation of this bulletin that of some of our commonest insects the life history is not known with any degree of exactness. The insects treated of are such as are found in houses and which either annoy the occupants by their direct attacks or are injurious to household goods and provisions. These are described in eight separate chapters.

J. F.

Miss Ormerod's Twentieth Annual Report, 1896.

One of the pleasantest events of the year for the economic entomologist is the arrival of Miss Ormerod's Annual Report. The liberality with which the distinguished authoress distributes these treasuries to students and public institutions all over the world brings them within the reach of all who may wish to profit by their perusal.*

It is seldom that any series of publications upon a single subject can show year after year such a steadily maintained, and even gradually increased, interest, as has been the case with these reports—new infestations of crops are being constantly investigated, old attacks restudied, and additions made to the previously recorded methods of treatment or prevention. It matters little in what part of the world a student may be located, he will always find something of value which may be profitably applied to his special work in fighting against the crop pests of his own country. The present report is no exception to the general rule. We congratulate our highly esteemed corresponding member on the practical and serviceable manner in which the subjects she treats of are presented to the public. As a writer in the *Queen* newspaper of late date says, "Miss Ormerod's work does not consist in playing with entomology, but is true, valuable, practical, scientific observation, and she enjoys the proud privilege of being regarded as one of the most reliable scientific observers."

On opening the report one is sadly reminded by the frontispiece, an excellent likeness of the late Miss Georgiana E. Ormerod, of the irreparable loss the authoress has suffered in the recent death of her much loved and highly talented sister, who has been her life-long companion and able assistant in the grand work she has done for economic entomology in England. The late Miss Ormerod was a naturalist of no mean

*These reports are also for sale by the publishers, Simpkin, Marshall & Co., London, at the almost nominal price of 1s. 6d.

standing and possessed remarkable talents as an artist. She is well known as the authoress of the magnificent series of thirty colored diagrams of insects injurious to farm crops. These are thirty inches long by twenty wide, and are most suitable for use in a class room or at farmers' institute meetings. In the preface of the report the sad event referred to above is touchingly and fittingly alluded to with a reference to the obituary notice by Dr. Bethune which appeared in the *Canadian Entomologist* for November last.

Among the various short monographs contained in this report of 160 pages many are of interest to Canadian farmers and fruit-growers either from the identical species occurring both in England and Canada, or from a similarity in habits between allied forms in the two countries.

Codling Moth: This is one of the yearly recurring troubles of the fruit grower to which most of the damage to apples may be laid. English experimenters do not even yet seem to have mastered the spraying of apple trees for the prevention of injury by the codling moth. The remedies are given by Miss Ormerod as follows: "Our only really available remedies against this infestation appear to lie 1st in destroying infested apples; 2nd in trapping the caterpillars and destroying their shelters; and 3rd on being well on the alert at the time of the blossoming of the apple, and by careful spraying preventing the very beginning of the attack." In this country the recommendation for the best remedy would be: "Spray with 1 lb. Paris green and 1 lb. lime in 200 gallons of water within a week after all the blossoms have fallen."

Beet Carrion Beetle: We have occasionally in the North-West Territories a rather rare attack upon vegetables such as squashes, spinach, etc., by the larvæ of one of the carrion beetles *Silpha bituberosa*. In England a very similar species has been the cause of serious damage to mangolds, and last season when other food failed attacked potatoes. The carrion beetles feed both on vegetable and decaying animal food. It is suggested by a correspondent to attract the beetles and larvæ from the crop by putting about the infested fields "a few wild pigeons, rooks, hawks or similar *vermin*." (*Sic.*) The ignorant farmer in England, as well as in other parts of the world, "generally shoots in spring" every hawk he can see. In this country the remedy which would first suggest itself would be dusting the crop with land plaster and Paris green (50 lbs. to 1).

Leather Beetle: An interesting account is given of an attack by *Dermestes vulpinus*. Large numbers of beetles were found in a building where bones had been stored for six or nine months for the manufacture of manure, and not only the bones were honeycombed, but also the posts and floors of the building over them, which were seriously injured by the larvæ, when full-grown, boring into the wood to pupate. Reference is also given to another similar occurrence near Sheerness, in Kent, which was upon even a larger scale than the one treated of by Miss Ormerod. This article is illustrated by excellent figures of the beetle, and its various stages, as well as a portion of a perforated bone and a piece of honeycombed wood.

White Cabbage Butterflies: Under the head of cabbage two species of *Pieris* are treated, and powdery dressings are recommended as fresh lime, soot and sulphur. The highly reprehensible practice of using Paris green upon cabbages is referred to, but Miss Ormerod wisely says she could not take on herself the responsibility of advising the treatment, more especially as the feeling against it might probably ruin the sale of the cabbage. There is no doubt of the truth of this last statement. There is never a season passes that instances do not come under the notice of the writer of people expressing fear of buying cabbages lest they may have been poisoned with Paris green. In addition to this the use of such a virulent poison is quite unnecessary. Pyrethrum powder mixed with three or four times its weight of common flour and kept for twenty-four hours in a tightly closed vessel is even more quickly fatal than Paris green, killing every caterpillar the powder falls upon, or upon which the infusion of the powder may run when it has been wetted by dew or rain, and further, this powder is not poisonous to the higher animals.

Croton Bug: An occurrence of this well-known guest at hotels and other large buildings heated with steam, is spoken of. The usual remedies adopted in this country

as powdered borax and the many brands of pyrethrum powder are mentioned, and "stoving" with sulphur is given a prominent place under remedies.

Deer Forest Fly: For some years Miss Ormerod has made a special study of the *Hippoboscidæ* or Forest flies, and another chapter of her most interesting observations on these little-known insects is given in the present report, with excellent figures of the common Forest fly and the Deer Forest fly.

Earwigs: The injuries of earwigs in hop gardens and to mangolds, swedes and turnips, likewise to apple blossoms, have been serious in 1896. The old method of trapping the insects in inverted flower pots or tin pots containing a wisp of straw has given good results; also beating them at night on to tarred boards.

The House Fly (*Musca domestica*, L.): One of the most interesting monographs in this report, at any rate to the general public, is an account of the troubles caused by the common house fly. The life history of the insect is treated of at considerable length with quotations from the several authors who have written on the subject of "flies" and a statement as to the serious annoyance by house flies in India upon horses. Dr. Spooner Hart, V.S., of Calcutta, sent numerous specimens of a fly which was examined carefully by specialists and found to be true *Musca domestica*. He says: "March 24th. It is the worst pest the horse has here, and at this time of the year it exists in thousands especially in the suburbs. It attacks in great numbers the eyes principally, and is constantly flying off and coming back all day long to the same site. This causes great irritation and inflammation, which, being continued day after day and neglected, will lead to blindness, disfiguration of the eyes and ulceration of the face.

"Our hackney carriages (cabs) here are drawn by wretched half starved ponies fed principally on grass, out all day exposed to the sun, stabled in filthy holes and are most disgracefully treated and neglected. Dozens of these unfortunate creatures are blind from irritation set up by these flies, and present huge ulcers on either side of the face just below the eyes, the result of constant lachrymation and irritation of the flies. The eyelids are thickened and averted and the appearance is awful. The flies are dreadfully persistent, and will not be shaken off." Under the head of Prevention and Remedies it is pointed out that as house flies as far as is actually known for certain, breed wholly in horse manure, much may be done to lessen the numbers by keeping stables clean and removing as quickly as possible all horse droppings and getting them into the land as soon as convenient. Further, as many observers believe that house flies breed also in other decaying matters it is advised to pay special attention to garbage thrown into ash pits.

With regard to the attacks of flies to horses' ears, eyes, etc., Dr. Hart writes that a carbolic wash when freshly applied will keep the flies away. Horses in India are also protected by eye fringes, made of hanging white cords which cover the eyes and prevent the flies from settling. The irritation to horses described above reminds us of the distressing accounts given by travellers in Egypt of the diseased condition of the eyes of the Egyptian beggars, particularly of babies and children, from the irritation caused by flies. The prevalence of ophthalmic troubles would suggest the frequent spread of these diseases by flies, the infection being carried from person to person.

As to the manner in which these sores are made Miss Ormerod says as follows: "Several other kinds of flies are very commonly to be found in our houses, including *Stomoxys calcitrans*, sometimes called the "stinging fly," which can give a painfully sharp prick by means of a needle-like proboscis. From these the house fly can be distinguished by its having not a sharp pricker, but a soft proboscis adapted for suction, but incapable of penetrating the skin, so that when these insects trouble man and animals it is only to imbibe their perspiration. But the various other flies which commonly pass under the name of "house flies" much resemble them in many particulars of their life-history, and speaking generally of these "flies" it is obvious that even of those which do not sting, where the foot has the "pads" covered with hundreds of hollow tubes secreting a viscid fluid by which they adhere to the smoothest surface, and the organs

used in taking food consist of minute formations called teeth by which the surface of the food is rasped, and thus new surfaces exposed to the action of the moisture of the fly's mouth, that it is not surprising that delicate parts, such as the surroundings of the eye, should suffer grievously, where, as in hot countries, they are buried under the constantly attacking masses of the pests."

Two simple devices are explained, one for catching flies, wasps, etc., out of doors in a wholesale way, the other for clearing a room in summer when flies frequently swarm into houses in annoying abundance. For the capture of flies in gardens Miss Ormerod advises the use of two square hand-lights, one set on the top of the other. The finger hole at the top of the lower one allows the flies to go up into the upper one, of which the hole is closed with moss or other material, and the lower one is raised up from the ground on bricks, with a bait of some attractive substance placed below. The flies after feeding rise up and gain access through the hole at the top to the upper light where they collect in thousands that soon die from the heat of the sun.

To keep flies out of dwelling houses Miss Ormerod tells of a plan contrived by her late sister, Miss Georgiana Ormerod. It is to close the lower sash of the window, then draw down the upper sash so as to open it about a foot at the top. Next draw down the calico rolling blind so that the flies are inclosed between the blind and the glass panes of the window, when, following their natural instinct, the flies rise, and when they arrive at the opening to the fresh air outside, out they all go.

A similar plan to the above has been practised in the dining-room of one of the hotels at Ottawa for some years, and has given great satisfaction.

Leafage Caterpillars: In this chapter several leaf-eating caterpillars are treated of, together with the well tried insecticides, Paris green and kerosene emulsion. It is evident that through Miss Ormerod's instrumentality these valuable remedies are gradually becoming better known and more generally used by English orchardists.

Mediterranean Flour Moth: We regret to read that this most injurious insect which was first noticed as mischievous in England in 1887, is now thoroughly established as a perfect pest in any roller flour mill where it once gets a footing, and also is to be found in bakeries, or the like places where the flour, on which its caterpillars feed, is present; and consequently now is in the course of unchecked spread, which has given the infestation thorough establishment. No new methods of treating the insect are spoken of; but an incidental mention is made to an important matter, *i.e.* the spoiling of flour by fumigating with sulphur, showing the necessity of knowledge and care in making use of this remedy. In Canada, even without any care on the part of millers, this infestation is of rare occurrence, the spread and increase of the insect over most of the Dominion being prevented or rendered easy of control by the low winter temperature, to which from time to time mills can be subjected.

Onion Sickness.—This attack due to the Stem Eel-worm (*Tylenchus devastatrix*) has never, so far as I am aware, been observed in Canada; but may at any time appear. The reasonable remedy proposed by Miss Ormerod should, however, be adopted for all vegetables showing disease. This is to destroy carefully by burning everything which shows a diseased growth, and on no account throw it on a manure pile to be put back again on to the land.

The Pear Lyda or Social Pear Saw-fly is of particular interest from the almost identical appearance and habits of the species with those of a Lyda found in great abundance last July in southern Manitoba on plum trees in the gardens of the Mennonites. Whole trees were seen, upon which nearly every leaf was seared and skeletonized. The foliage of large branches was frequently webbed tightly to the twigs, forming a tent containing scores of the curious false caterpillars The remedy of spraying the trees early in June with Paris green would certainly have saved the trees.

Pear and Cherry Saw-fly (*Eriocampa limacina*) —The Pear slug every year does much harm in Canada. This is almost invariably from the fruit grower's neglect. These caterpillars can be easily controlled by spraying or dusting with Paris green.

Surface Caterpillars (the cutworms of this country) did much damage in 1896. The chief point of interest is a trial of a mixture of nitrate of soda and salt (proportions not given) hand sown after hoeing between the rows and between the roots—at the rate of about 3 cwt. per acre. The results of the trial seem to justify a further test of this remedy which at any rate would invigorate and help the remaining plants to make a vigorous growth.

Caddis Worms were troublesome in beds of watercress and did considerable damage. This plant is cultivated in shallow canals with running water and is grown in large quantities to supply the city markets. The foliage is destroyed by the encased larvæ of several species of water flies which crawl nimbly about the plants. The most successful remedy was found to be to flood the beds deeply and then disturb the Caddis worms by passing the backs of wooden rakes very thoroughly over the plants. The worms let go their hold of the plants and rise to the top of the water and are carried off down the stream past the beds.

The above brief references are merely to those articles in this valuable report which are thought to be of direct interest to us; but there are many other subjects treated which may at any time demand our attention. The great charm of Miss Ormerod's reports is that she does not theorize and when reading them there is always an overwhelming feeling of confidence that any observation or investigation recorded is put down absolutely as she saw it.

J. Fletcher.

The Rev. Thomas W. Fyles, F.L.S.

We have much pleasure in presenting to our readers the excellent portrait of our colleague, the Rev. Thomas W. Fyles, who has been for many years an active member of the Entomological Society of Ontario. Though living at South Quebec, he has regularly attended the annual meetings at London, travelling many hundreds of miles in order to do so, and has invariably delighted those present with his excellent papers. He was a member of the Council from 1882 to 1888, when the change in the Act of Incorporation required the directors to be resident within certain districts of the Province of Ontario. Three times he has represented the Society as their delegate to the Royal Society of Canada at Ottawa, and he has been a member of the Editing Committee of the *Canadian Entomologist* since 1889.

While filling the arduous position of Chaplain to the immigrants landing in Canada, under the auspices of the Society for Promoting Christian Knowledge, he devotes any spare moments that he can get to the study of entomology. He has succeeded, with an energy and enthusiasm worthy of admiration, in forming an extensive collection of insects and acquiring a knowledge of the science beyond what is ordinarily met with. That he may long continue to carry on his excellent work, both in his official position and in his scientific pursuits, is the hearty wish of all his friends.

INDEX.