

form a correct estimate of the agricultural capabilities and the varied resources of this vast territory, without reference to the bays, arms of the sea, and to the great and innumerable small lakes, such marked characteristic features of the country; for these great bodies of water add immensely to the value of our possessions climatologically and agriculturally."

In speaking of the "position on the globe of Canada," the author thus sums up briefly some of the excellences of the country, as compared with other less favored lands:—

"Canada is in the latitudes of the most valuable cereals and grasses, and, consequently, where appropriate food in the greatest abundance can be found for man and beast. It is, in climates and productions, similar to the region in the old world most favorable for the sheep and the ox. It is the latitude in which man attains the greatest energy of body and mind. It is the latitude from which have sprung conquering races and the races that rule the rest of the world. It is the latitude from which the migrating races in modern as in more ancient times have come, for as man is here most robust, so here he multiplies most rapidly. While the more feeble races of the south of Europe scarcely keep good their numbers, the northern races are constantly sending their surplus population by thousands and even by hundreds of thousands, out to this continent."

The section on "The Climates of Canada,—Temperature and Rainfall," is very instructive to those who, knowing little of the country, have suffered their minds to be prejudiced against it. From this section we make a brief extract; it is confirmatory of the opinions we have long maintained:—

"The summer temperatures are those of chief importance for agricultural purposes. The cold of winter has no effect upon those annuals for which the summers are long enough and warm enough to secure their maturity. But the frosts of winter have a powerful effect in pulverizing the soil, and the snowy covering protects the ground from the winds and sun of the late months of winter and early spring; then the gradual melting of the snow fills the soil with moisture so necessary for seeds and plants, presenting such a contrast to many countries in the south of Europe and many western States, where the ground, exposed for months without such a covering, is too dry for vegetation. Our forest trees—some of them almost semi-tropical, as the tulip, popperidge, grape vine, &c.—have stood the frosts of centuries and still flourish; some of these monarchs of the woods have been found 500 years old."

"Wood-land, Prairie and Desert," and the succeeding section, "The Climates of Canada as Indicated by the Natural Productions," will well repay the attention and reading of the most indifferent.

Taking the book as a whole it must convince the most sceptical that the Dominion, despite all the "drawbacks," is from her great natural capabilities destined to be a prosperous and powerful state.

With one or two short extracts we must lay down this work for the present:—

"Where certain forest trees, vines and plants have fastened themselves without the care of man, they give us the best proofs of those uniform conditions of heat and moisture favorable for their growth. Many of the trees in the forests of Canada, the most remarkable forests of deciduous or leaf-falling trees on the globe, require a summer temperature of 67 degrees of Fahrenheit and a copious fall of rain. The western coasts of both continents, in the Old and New Worlds, in high latitudes, have the necessary moisture but not the summer heat; hence the absence there of leaf-falling trees, except certain species in favored localities. The prairies both east and west of us have the required summer heat, but not the moisture, and those regions are destitute of all trees."

"Climates fatal to forest trees could not be favorable for fruit trees, nor indeed for

any agricultural products." Hence the absence of forests and the frequent failure of crops throughout the Western States from the deficiency of summer rains.

"The high summer temperatures and abundant summer rains in Canada are unquestionably those conditions of climate necessary to produce these peculiar trees."

"The productions of Canada are mostly similar to those of western, north-western and central Europe, the great staples being those of the middle and higher parts of the temperate zones. The cereals, grasses, root-crops and hardier fruits of Europe find here more than in any other part of the American continent, their appropriate climates. The three decennial census of Canada show that we produce more abundant crops of the cereals, grains, grasses and root crops, and those of better quality, than any of the States of the Republic. This is true of wheat, oats, barley, peas, rye, most of the ordinary root crops (as potatoes, turnips, beets, carrots, &c.) and the hardier fruits. The Canadian census of 1851 shows that Canada even then produced one-sixth as much wheat as all the thirty-one states and four territories, one-half as much peas, more than one seventh as much oats, more than one-fourth as much barley, and nearly one-eighth as much hay as the entire Republic. The census of 1860 and 1861 was still more favorable to Canada; for in wheat she had one-sixth, in oats one-fourth to one-fifth, in barley one-third, and in peas nearly equalled the 34 states and 7 territories." A.T. Ed.

Crop Prospects, Prices, &c.

Fall wheat must be a very low average crop this year. Some pieces are good; but for one good piece we have seen one hundred bad. The grain may be good, but the average yield per acre for the land sown must be small, much smaller than any statistics have shown, as the fields that have to be turned under and re-sown with spring crops are not generally shown in our statistics.

A very large average of last year's grass seeds have been destroyed by the frost, or rather by drouth and unseasonable warm weather in February, followed by severe frost. This has been the cause of the destruction of evergreens such as never before was known.

Spring crops are very cheering. They promise more than an average yield. In our last issue we advised our readers to strive and sell as soon as the weather would permit, without danger of storing too soon. Some have kept their word. We think they have lost the price the *Advocate* would cost them for 20 years by the neglect.

The apple crop must be the largest ever known. Be prepared to dry, store and make cider; raw and uncooked apples do not pay much to feed to stock.

Cherries and peaches will be only a moderate crop. Plums more abundant than usual.

Potatoes are being destroyed in some sections by the potato bug. Those that keep them well killed will have a good crop, and we anticipate fair prices.

The dairy business is progressing most favourably. Plenty of grass and good prices.

The root crops are as promising as we can desire. Everything looks like progress and prosperity.

Carter's Open Ditcher.

We had an opportunity of seeing this new implement at work. A large wheel is placed in a frame attached to a common plough; it takes the earth raised by the plough, carrying it in an elevated, horizontal position, and leaving it from three to nine feet from the plough, depending on the size of machine. It was the small machine, worked by one span of horses, that we saw in operation, and are fully convinced that it will become in demand as soon as it is seen by any farmers that are troubled with wet land and require open ditches.

Agriculture.

Influence of Paris Green on the Potato.

READ BEFORE THE NATURAL HISTORY SOCIETY OF THE MICHIGAN AGRICULTURAL COLLEGE, BY R. C. KEDZIE.

The scientific man has a two-fold duty to perform for the public—to give warning of danger when there is cause for apprehension, and to allay fear where there is no good ground for alarm. I propose to show that the fear of poisons being introduced into the animal system by eating potatoes produced on vines to which Paris green has been applied to destroy the Colorado potato bug is without good foundation, unless the Paris green is used in needless excess. Much unnecessary alarm has arisen in the minds of those who have used such potatoes, and doubtless many farmers have for this reason been deterred from using the most effectual remedy yet found for the devastation of this western border ruffian. In many places produce dealers have refused to buy potatoes protected by Paris green while growing, or have bought them at a reduced price.

Paris green is unquestionably a deadly poison. It consists of the aceto-arsenite of copper, adulterated with about 10 per cent. of sulphate of baryta. This last ingredient is without action on the animal system, but the aceto-arsenite or copper contains both arsenious acid and copper, substances everywhere regarded as poisons. The apprehension therefore that the potato might be injuriously affected when these substances were applied to the soil on which it was grown was very natural.

It has been supposed to be a sufficient reply to any question about its poisonous effects on plants, that Paris green is entirely insoluble in water. Storer, in his *Dictionary of Chemical Solubilities*, says:—"Insoluble in water, but is partially decomposed by continued boiling with water, soluble in ammonia water." As the water in our cultivated fields is not subjected to a process of "continued boiling," this might seem to settle any question of danger from this cause.

But the water in the soil is almost never pure water, but is more or less saturated with carbonic acid, and contains small quantities of salts of lime, potash, etc. The question is, will water so found in our soils render soluble any element of Paris green? To test this matter in an extreme form I suspended a quantity of Paris green in water, and through this passed a washed current of carbonic acid for twenty-four hours. The water filtered off from all solid residues gave a somewhat abundant precipitate of sulphide of arsenic when a stream of sulphuric acid was passed through it, but no sulphide of copper. It seems therefore that the prolonged action of a solution of carbonic acid will render a portion of arsenious acid soluble from a commercial article of Paris green. The insolubility of the aceto-arsenite of copper in pure water is not therefore an adequate protection against its poisonous influence when placed in contact with water charged with carbonic acid, as all water in the soil is found to be.

Again, rain water often contains a minute quantity of ammonia, and as Paris green is soluble in ammonia water, another source of danger might arise from this cause; but it requires a somewhat concentrated solution of ammonia to dissolve the substance in appreciable quantity. Thus, if we take a solution in strong ammonia water, and add it to a large volume of pure water, almost the whole of the aceto-arsenite separates in the insoluble form. The danger of solution of the Paris green from the minute quantity of ammonia in rain water is a nullity.

In all this discussion of possible danger I confine myself to the question of its solubility, because it is now conceded that a substance can enter plant life only in the state of solution.

If water charged with carbonic acid will separate arsenious acid from Paris green in a soluble form, the question arises how are we protected from its poisonous influence, since rain water and the water in the soil is always more or less charged with carbonic acid? I reply that the conservative element in the problem is found in the soil itself. In cases of poisoning by arsenic, the remedy is the hydrated sesquioxide of iron, by means of which the arsenious acid is converted into the insoluble basic arsenite of iron. Ten parts of this hydrated ferric oxide will completely precipitate one part of arsenious acid, from which

no amount of washing will separate a particle of arsenic. The same hydrated oxide (brown peroxide) is found in greater or less quantity in all cultivated soils, and in proportion to the amount present is the power of such soils to withdraw from solution the arsenious acid. To test this matter I mixed a small quantity of Paris green with a large quantity of soil moistened thoroughly with rain water, let the whole stand for 24 hours, and then allowed the rain water to flow off, and tested this water for arsenious acid, but not a particle was found. I repeatedly washed the same soil with rain water, but no arsenic was present in these washings or filtrates. By treating the same kind of soil in the same way, except by addition of a much larger quantity of Paris green, I readily found arsenious acid in the filtrate. In this case the quantity of arsenious acid which became soluble was in excess of the amount which the limited supply of hydrated ferric oxide could convert into the insoluble form. This shows that it is very possible to use Paris green in quantities which would prove injurious to the soil. But even in such cases I apprehend that there is but very little danger of the potato tuber being poisoned so as to endanger the health of the consumer. Arsenic is equally deleterious to the vegetable as well as the animal system. If added in dangerous quantity to the plant, the plant dies, no potatoes are formed.

The quantity of Paris green necessary to prevent the ravages of the Colorado potato bug is very small, and in such minute quantity is without injury to the plant, or danger to the consumer. One-twelfth part by weight of Paris green to one of flour, the mixture dredged on the potato leaves, so as to color the leaf, is sufficient, unless washed off by rain or blown off by winds, in which case it should be renewed. The insect in eating the leaf consumes also the flour and Paris green, and a very minute quantity is sufficient to end his days of usefulness.

If cattle should eat potato tops thus seasoned with Paris green, they would be in danger of poisoning. Persons should avoid breathing the dust of Paris green, as danger might arise from this cause.

But, notwithstanding all theoretical considerations of the behavior of Paris green in the soil or out of it, the question comes up, do potatoes produced on vines to which Paris green has been applied during the period of growth contain arsenic in any form? I answer no! I made a careful analysis of potatoes grown in this neighborhood to which Paris green was freely applied, and that repeatedly, and not a particle of arsenic in any form was detected.

The conclusions I draw from this investigation are:—

1st. That the arsenious acid contained in Paris green, while soluble in water charged with carbonic water, becomes inert in the soil by combining with the oxide of iron contained in the soil, provided the Paris green is not added in excess.

2nd. That Paris green may be used in quantities so small as to be entirely harmless, and yet destroy the Colorado potato bug.

3rd. That however freely used by being applied to the growing plant, Paris green does not impart arsenic in any form to the potato tuber, and there is consequently no danger in using such potatoes as food.—*Michigan Farmer.*

AN ENGLISH AUTHORITY ON AGRICULTURE.

To farm successfully we must farm well. Land is honest, and will repay for an outlay. Drain wherever it is required; manure freely; cultivate well; then stocks will thrive and fatten, crops will be luxuriant, milk will be rich, and cheese and butter with proper management will be good. It is waste of time to enter upon large poor farms without cash to improve them. I should prefer occupying 100 acres of good land to 300 acres that were exhausted. The expenses of management would be considerably less, the profits greater, and interest on capital not so much. Poor land is ill adapted for feeding, dairying, or tilling. Cattle will neither milk nor fatten, and crops are not so remunerative. We live in very uncertain times. All descriptions of agricultural produce are alternately high and low, and it is not wise to depend entirely on any single branch of farming husbandry, but make careful and proper divisions, resting assured as seasons revolve and changes take place all in due order will give a proper return.