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THE ILLUSTRATED

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THE EXHIBITION.

We have to acknowledge the receipt of the Prize List of the Agricultural and Industrial Exhibition of the Province of Quebec, kindly sent us by S. C. Stevenson Esq. Secretary of the Council of Arts, &c.

The Exhibition will open on the 14th of September, 1881, at 9 a. m., and will close September 23rd at 2 p. m. The Show of Horses, Cattle, Sheep, and Swine will open September 16th.

For further information, application should be made to S. C. Stevenson, Secretary to the Council of Arts, &c. or to G. Leclerc, Esq. M. D. Secretary to the Council of Agriculture.

I hear that at the exhibition in September there will be a Dairy in full operation. Messrs. Childs and Jones, of Utica, New York, have undertaken to provide everything fitting. I do hope our friends in the country will pay attention to it, and try to learn how to make their butter a little better than the generality of it is now.

And this reminds me of a curious fact. There is, it seems, a real French breed of cattle in the province, descended from the Norman and Breton stock. There is no class, as far as I know, in which they can compete, except the milch-cow class. The first prize in that class was won last year by a magnificent beast of Mr. Cochrane's, by Royal Commander out of a Kyloe heifer. It would, clearly, be absurd for a French-Canadian cow to contest the prize with such an animal as that; but if the breed has really been preserved in a state of purity, as people who ought to know say is the case, if there is no class assigned to them (I think there ought to be one), would not some patriotic person arrange that half a dozen cows and a bull should be entered, either as extra stock, or "not for competition."

I, of course, believe in the Shorthorns, as we have them in our English dairies, as the paying stock for this country. But we all know the *habitant* is not ready for them yet, if he ever will be, and in the mean time I do not see why, as every thing seems to be done for him, why this part of his stock should be left out. The Jerseys and Guernseys were poor things when I first recollect them, but the exhibitions in their native islands have done wonders for them. Of course what I say depends entirely upon the condition that the breed has been preserved *pure*. I hate a mongrel as much as anybody, and would on no account encourage the use of half-bred males. I have often seen, near Joliette, heifers with many of the points of a good Guernsey; the colour, head, and eye, particularly good; bag small, no doubt, but the keep was of the poorest; the wretched sandy land there would starve a Kerry, almost.

A. R. J. F.

(*Translation*).

Memorandum on the production of meat, butter and cheese in the Province of Quebec.

To the Honorable MR. CHAPLEAU,

Premier and Commissioner of Agriculture and Public Works.

SIR.—In accordance with your request, I have the honour to send you the following statement:

It appears that out of the millions of dollars derived from the exportation of Canadian cattle to Europe, our Province can hardly claim more than a few thousands.

One of the British Shipping laws, which to me appears very unjust, requires that on every vessel a certain quantity of cubic feet be allowed for each head of cattle, whatever may be its weight. The effect of this is to favor the exportation of large, and prevent that of small cattle. In fact, for an animal weighing 3,000 pounds, the same freight is paid as for one weighing 800, although the latter only takes up about one half the space of the former. It is to be hoped that this law will be altered, or that new lines of steamers will throw open other markets than the English ones.

In the French part of our Province, particularly, the system of cultivation hitherto followed has produced only small cattle, but these animals are remarkable for the quantity and richness of their milk, and for the excellent quality of their meat.

We are often advised to change our herds of cattle, with a view to the English export trade, but to do so we should have to completely alter our agricultural system. We must make rich and abundant, meadows which are poor, and pastures which are wretched. We must cease to feed cattle on straw during the winter. Finally, we must put in practice the principles of good agriculture, and we are, almost everywhere, ignorant of them.

But I think I am in a position to show that, so far as meat-producing is concerned, such a transformation would be hurtful instead of beneficial. In the first place, it is known that it is the smaller bovine races, such as the *Kyloes* of Scotland, the *Kerries* of Ireland, and the hill breeds of Wales, which sell for the highest prices, pound for pound, on the London markets. The same applies to certain small

breeds in France, in the Paris markets. Moreover, it is established in a manner which seems to be incontestable, that the production of the best meat, under the most favorable conditions for export, does not offer the same advantages to the farmer, in our old parishes, as the production of milk. I do not hesitate to affirm that our Canadian cow is one of the best milch cows in the world. Apart from exceptional circumstances, therefore, we must attach most importance to the manufacture of cheese and butter.

The immense territories situated at the foot of the Rocky Mountains produce millions of cattle at a nominal price, the Texas cow is worth little more than $2, the prairies are, there open to all; on them are found thousands of animals, all belonging to the same owner. Latterly, their herds have been greatly improved by crossing them with the best breeds for meat-producing purposes. This improvement is rapid, since a single bull annually affects the produce of from 80 to 100 cows. A few horsemen conduct these immense herds from one place to another, until the cattle arrive, half-fattened, at the first railway station. Thence they are transported to the localities where maize abounds, and after a few months the animal is brought to the New York, or even the Montreal market. If he be a choice animal, he generally sells for five cents a pound. live weight, but the average price per head for heavy cattle is about four cents per pound for choice animals. Everything leads me to believe that these prices will be maintained for many years to come, owing to the immense territory, both in the United States and in Canada, where the food of the cattle costs nothing, or next to nothing.

It is also established, that in order to produce 100 pounds of meat, live weight, the animal must receive the same food as is required to produce 64 pounds of butter or 175 of full-milk cheese Counting the butter at 23 cents, and full milk cheese at 11 cents a pound, on the average, we get the following result · The same quantity of food would give, say,

100 lbs. of meat, live weight.....	$ 5 00
or 64 lbs. of butter at 23 cents.....	14 72
or 175 pounds of full milk cheese at 11 cents.....	19 25
or 64 lbs. of butter, $14.72, and 120 lbs. of skim-milk cheese at 8c. $9.60	24 32

The last mentioned fact was clearly proved last year in the United States and in Ontario. I have given the average prices obtained last year for the best produce. Unfortunately our average butter and cheese is far from doing so well, but this is solely due to want of care and knowledge on the part of the makers.

I know of no statistics which give the number and value of the cattle fattened in this Province, but it is a fact that the Quebec markets, and especially those of Montreal, are largely supplied from Ontario. I think that we can hardly produce enough for our home consumption, and the small number of fat cattle exported from this Province is more than compensated by what we import for the supply of our most important centres.

But we must at present possess at least a million milch cows ; and our farmers might easily treble the number if they knew how to get more profit from the production of milk. It is equally certain that our cows can easily be made to double their production, and, in some cases, treble it, by feeding them better and thus render them more remunerative. Still, in the present state of our agriculture, the production of butter for our local markets, and for export, must be 33 millions of pounds, or its equivalent in cheese. Counting the butter at 15 cents a pound only, this makes about five million dollars per annum which our farmers get for their dairy produce.

It is this sum which it is easy for us to double, and in a few years multiply ten fold, while transforming our agriculture, not spasmodically, but without radical changes, I might say without routine perceiving it!

But in doubling the present revenue of our d iries, we increase all our farm produce in the same proportion. More productive herds give richer and more abundant manure. This, in its turn, increases the returns of meadows and pastures, to which succeed better harvests of grain, without increase of labor or expense.

By thus developing the produce of our dairies, hardship, poverty, and the depopulation of our country by emigration, will be succeeded by ease, plenty, and comfort. It is, unfortunately, established that, from want of knowledge and care, the butter made in this province only fetches one third of the price of the best butter on the European markets. As to our local markets, we every day see fine butter worth, and selling regularly, for double the price obtained for the greater portion of the butter offered for sale.

The following figures taken from English market reports prove this.

For instance when butter from Denmark and Norway is quoted at 140 to 160 shillings stg. per 112 lbs.; American and Canadian factory butter, at 110 to 135 shillings stg. per 112 lbs., that known as Kamouraska, obtains from 60 to 75 shillings per 112 lbs., and considerable quantities are sold to make cartgrease.

As to the few butter factories established in this province, it is admitted that they get about double the price paid for ordinary butter on our markets. From this we see how important it is to give as much assistance as possible towards establishing butter factories.

Ten years ago, we had not in the French portion of the province, as far as I know, a single cheese or butter factory worked by a company The lectures given in our parishes, by order of the Government, showed the advantages of such associations, of which our neighbors had the monopoly. To-day we must have over 200 cheese factories, and their number is increasing in a surprising manner. I estimate at one hundred the number of new cheese and butter factories which will commence working next spring.

Unfortunately, what we still want is adequate knowledge, to enable us to derive all we should from this industry. For instance, I know a good many factories, among the very best, which are often obliged to have recourse to foreign workmen, who cannot even speak French. I know American women who get, in our Canadian factories, from $50 to $60 a month and their board, while, in Ontario, the average wages are $25, without board, for men, who are stronger and equally expert. Here, also, the buildings and apparatus are too primitive, and the consequence is that we lose from 10 to 20 per cent of the value of all our cheese products. As to the butter factories, I know several which are looking for workmen without knowing where to find them, and who are asked as much as five dollars a day, while in Ontario and the United States the prices are the same as for cheese makers, say $25 a month.

In Ontario the same obstacles had to be overcome.

As early as 1867, the Provincial Government took the matter up, and passed an act to encourage associations for the manufacture of cheese and butter. There are two of them, known as the "Eastern" and the "Western Dairymen's Association." They are worked on the same principle as agricultural societies, and receive from the Government an annual grant of $1000. Each of these associations meets annually, and their sessions last three days, there are three sittings a day. I have frequently attended these meetings and have been astonished at the interest they excite; the rooms were crowded, and the sittings lasted from 10 a.m. till 10 p.m., exclusive of meal hours. Short-hand writers take

down all that is said, and these reports are telegraphed by the associated press, and published in several papers. They are then revised and corrected, and printed in the annual reports.

When their meetings are held, these associations get some of the most competent and best informed men in the United States and Canada to attend. These men are present a the meetings; they give a synopsis of their unpublished studies, and answer all questions which the members put to them.

In the past few years, each of these associations has engaged the best cheese makers they could get in the United States. They receive an annual salary, and their duty is to work in the principal cheese producing centres, and to teach all they think necessary to make these establishments more productive

It is important, it seems to me, for us also to take steps to develope our dairy manufactures. Our climate and our seaports give us a great advantage over the remainder of America. I have myself frequently heard this admitted at the meeting held in the Western extremity of the Province of Ontario, at which were present the best American authorities.

What we require is a thorough knowledge of the trade. In order to obtain the best results, we must first form Canadian cheese and butter makers, to whom all the secrets of the trade should be taught. With the surprising aptness which our fellow-countrymen have displayed, in this as well as in many other things, we may safely say that, when they shall have been initiated into this art, cheese and butter factories will multiply by themselves without the intervention or assistance of the Government.

In my opinion it is not necessary for us, for the present at least, to make grants to associations like those in Ontario. It would be sufficient for us to have the services of some of the best workmen who could be found, to act as teachers.

Private industry of itself and without Government aid, will supply an establishment, a model in its construction and apparatus, and already managed by an expert Canadian workman. Very soon we shall probably have a second factory, also a model one, but situated in a different part of the Province. The duty of our chief teacher should be to teach in the first factory, both to the manufacturer himself and to his apprentices (who may be obtained in numbers), all the secrets of making butter, full- and skim-milk cheese, according to the best known methods.

When the first establishment can stand alone, our teacher should do the same for the second.

I am convinced that, with an able assistant, our chief teacher could, in a short time, form factories in different parts of the Province which would really be model ones. During the winter, the teachers should visit the principle centres, and convene public meetings of all persons interested in the manufacture of cheese and butter. These meetings would cost nothing, beyond such travelling expenses as the Government would authorize. As to the publicity to be given, we already have the Journal of Agriculture, and if anything more is needed, the annual report of the Department of Agriculture would supply it, to the great benefit of the country, and to the credit of the Province. This Sir, is, what I have thought advisable to submit to you. The sacrifices you have already made in this direction, by sending competent men to the United States and Europe to study and report on the development to be given to our dairy manufactures have induced me to mention what I have stated above.

The Legislature votes, annually, $50,000 to agricultural societies, and it is admitted that in the present state of several of these societies, a considerable portion of that sum does not produce the good we have a right to expect from it. The agricultural Act (sect. 36 § 5) allows the Council of Agriculture to retain as much as one-third of the grant to the societies for the encouragement of such agricultural industries as may be developed with advantage. On this principle, the Government may, if it thinks proper, obtain from the Legislature a vote of $48,000 for the societies direct, and $,2000 for the development of dairy manufactures.

This sum would amply suffice to secure for us the services of two workmen, to act as teachers, and to pay the travelling expenses authorized by the Department of Agriculture.

When such travelling expenses are incurred exclusively for the benefit of private factories, the latter would, of course, have to pay them.

This is, in my opinion, the most pressing need towards improving this essential portion of our agriculture. It is true that the greater undertakings, such as beet-root factories, the utilisation and distribution throughout the country of artificial manure, will do a great deal of good, and largely contribute to the general prosperity of the country; but what we chiefly want is, to render as profitable as possible an industry whose products cannot be too plentiful, and which already exists in every farmer's family in the country; an industry which can develop colonization to the greatest extent, and thereby proportionately increase the value of our public lands; in a word, an industry which is calculated to transform, and that by degrees, the whole agricultural system of the province, from the very moment that it is properly carried on. We have already the herds, the pastures, food for winter, and the necessary capital. What we want is, solely, knowledge, and that enlightened management which will have the effect of enabling us to obtain from the same capital, instead of produce of little value and uncertain profit, returns which may be increased ten-fold in a few years, and, in time, even an hundred-fold. We can easily obtain these results by means of active, enlightened and persevering labor, without drawing too hard on the public purse.

The whole respectfully submitted.

Signed, Ed. A. Barnard,
Director of Agriculture.

AGRICULTURE.

Paris, May 1881.

Contemporary events having brought Algeria to the front, a few notes on the agriculture of that French colony may not be uninteresting. Since Algeria come into the possession of France in 1830, not more than 6.000 French on an average, have emigrated there per year. This slowness is due, not only to the innate repugnance of the French to quit the mother country, but also to the insecurity for life and property in the colony (frontier emigrants must be protected by military camps), and the difficulty of purchasing good lots of ground from resident Arabs, who apparently love their soil as much as they proverbially do their horses. Of these there are two distinct races, the Barbary or African, and the Syrian or Asiatic. There are several crosses, but too few or too unsuccessful to be taken into account.

The Barbary horse is about 60 inches high, very irregular in form; the pasterns very long, the hoofs very narrow, which produces the infirmity of halting, very common when these animals are imported. The Syrian is the ideal of the Arab horse: its points are generally irreproachable, and in height it is superior to the Barbary. Both races well deserve their reputation for strength and endurance. They are as sure-footed as a Spanish mule: they will traverse,

without making a false step, ravines of loose stones, and rocky surfaces intercrossed with branches: rough or favorable paths taken together, these horses will do their 35 to 60 miles day after day, demanding only a little green food, and drinking but once. There are eight principal horse fairs in Algeria, where a choice can always be made out of 500 animals. The Arab pays little attention to keeping up a breed: possessed of a mare, he allows her to be covered by the first stallion at hand, his object being merely to possess a foal. The government, with the view of methodising the reproduction of horses, has established studs, where first class Syrian and Barbary stallions are kept; at the same time it gives prizes for the best stallions of any cross breed. Marked progress can not be recorded respecting black cattle; a few Durham-Arabs are to be met with, but the general breed is the Iberic, whose live-weight varies from 4 to 6 cwts, when fattened. They are very well shaped, the skin is supple—proof of an aptitude to fatten; the hide is generally black, the loin, chest, and muzzle, white. For labor, the Morocco ox is the favorite; its bones are larger, and the skin less supple than the Iberian breed: the color is generally red or wheaten: when fat, the animals weigh 8 cwts. Although the sheep comprise two well-defined breeds, Asiatic and Sodanic, they are classed by the natives under the generic title—Barbary. The parent type is famous for enormity of tail, whose substance, scientists assert, resembles butter rather than suet. Breeders endeavor to effect crossings to diminish this excessive tail, which develops at the expense of the other parts of the body. These sheep, when fat, attain a live weight of 90 to 100 lbs; the flesh is rather hard, but tastes well. The fleece is coarse, contains no grease, and that of an adult weighs 6½ lbs. Algeria sends 600,000 head of sheep annually to the French market, but this supply depends on the season not being too dry, droughts being drawbacks to the colony. Attempts are being made to cross the Barbary with the Merino: no marked results have been yet attained, which is the more strange, as Algeria is the cradle of the Merino race. Until the nomadic Arabs be civilized, no sheep-runs can be founded. Ostrich farming is being successfully tried: a pair of adult birds furnish 30 eggs yearly, which are hatched by an incubator: in a short time, the young birds represent, each, a value of fr. 1,000. Vine-culture is rapidly progressing; on an average, a good acre of vines produces fr. 720 of wine per vintage. Three years after being planted, a vineyard is remunerative, and a good yield at the expiration of five years repays all capital, including even the fee simple of the land. The climatic conditions of Algeria are favorable to the vine, but the preparation of the vine is still in the rudimentary stage, and no serious attention is paid to specialty of culture. Land is purchasable at fr. 20 to 80 per acre, and rented at fr. 2 to 8; near towns, market gardens pay from fr. 8 to 40 per acre. Farms are chiefly rented for three years without conditions; the tenant consequently racks the soil as much as be can; the *métayage* plan is however more general. In this case the proprietor and tenant, after deducting the grain necessary for sowing, divide the harvest, share and share alike; the tenant, disliking manual labor as much as does the landlord, sublets his right, and thus becomes a middleman. As there exists not a shred of confidence between him and the proprietor, the contract only lasts for a year. The landlord supplies the use of the implements, and advances any necessary moneys: the tenant supplies his labor. With the natives, a few head of cattle is all that links them to the soil; everything with them is primitiveness itself.

Paris and Berlin have each an agronomical university of the first order: respecting the relative educational value of either, it is admitted, that the French college has a more systematic and co-ordinated programme of study, but that Berlin is vastly superior in all that relates to the practical illustration of lectures, such as richly furnished museums, laboratories &c. The German government has refused nothing to luxuriously provide the *matériel* for the highest agricultural education.

The cultivation of beet occupies a large amount of public attention. France produces about one-fifth of the total European yield. About 5 per cent of sugar is obtained from roots grown in this country, while in Germany and Austria, the return varies from 8½ to 8⅓ per cent. The reason of this difference is due to French farmers aiming at once to secure roots that will simultaneously repay the sugar manufacturer, the distiller, and the stock fattener. Large roots are the terror of *fabricants*, while growers complain that the factories do not offer prices to encourage the raising of smaller-sized ones. In Belgium, agriculturists assert they are ruined by accepting the seed supplied by the factory proprietors; however, there can be a serious difference in the richness of a variety of beet—as much even as 6½ per cent. The aim in sugar beet culture is, to plant in narrow lines, moderately manure, secure a root about 2 lbs weight, of a variety, globular, not growing much above ground, with few roots and hence easy to lift, and, subsequently, to manipulate. Of the prospects of this season's crop, sowings are late and vegetation three weeks in arrear, the advantage however is clearly in favor of early sowings, so far.

Another moot point now occupying prominent attention: what is the best base for determining the commercial richness of beet? The majority advocate selling according to density, but Professor Petermann of Belgium, leans to the system of saccharine richness. In the former plan, the better theoretically for all interested, the chief difficulty lies in its application. M. Pagnoul, an authority in the dispute, lays down a juice density scale, commencing at degrees 4. 5 and rising by tenths to 7. A density of 5 degrees, would represent a saccharine richness of 9. 5 per cent, and a yield per acre of 20 tons, at the price of fr. 16 per ton: a density of 7 degrees, 15 p. c. of sugar, a return of 13 tons per acre at a price of fr. 38 per ton, being a monetary difference in favor of the latter, of fr. 94 per acre. A juice of a density below 5 degrees becomes unremunerative, not only on account of containing less sugar, but more foreign matters detrimental to the extraction of the sugar. The density could be estimated, by having an independent official at the factories, who would determine it from half a dozen of average sized roots, three to be selected by the *fabricant*, and three by the farmer. Some agriculturists, in order to increase the density of the juice, have recourse to the fraudulent plan of applying nitrates to the beet during the last stage of its growth; this induces fresh vegetation; the root augments and also the leaves, but at the expense of the sugar in the tissue of the roots, so that the density which was 5 degrees falls to 4, and the *fabricants* quickly discover the fraud. M. Pagnoul advocates the raising of 11 beet roots to the square yard, each root to weigh about 14 ounces, and the yield per acre to be 16 tons. A ton of beet carries off from the soil 13 lbs. of alkaline salts. Manures for beet ought to be of nature to be rapidly assimilated, capable of acting at the commencement and middle state of the plant's growth, during the period when light is strongest and longest, and so more favorable for the production of sugar. A slowly acting manure produces the same effect on the roots as the fraudulent application of nitrates just described. To avoid such a result, German farmers apply farm-yard manure to the preceding crop, employing a limited dose of nitrate of soda and superphosphate, following the wants of the soil, before sowing. All that tends to produce a rapidly developing root can only be favorable to its saccharine qualities.

From the result of various experiments, M. Lacroix has found that the most profitable manner to employ dried blood

and bad meat as manure, is to mix them with sulphate of ammonia (1).

Special manures.

When, in England, about thirty years ago, James Odams formed his manure company, the prejudice against chemical manures amongst average tenant farmers was great. It was looked upon as a sort of extravagance only fit for the use of the noblemen and great squires who had fancy farms. The "King of Farmers," as he was called then, John Hudson, of Castle Acre, was seriously reproached when, before Odams' manure came into the market, he announced, at a meeting of the Royal Agricultural Society, that he had found a check to fly in turnips by the use of Lawes' superphosphate guano. The foundation of the portable manures was a foreign substance, and these were somehow associated in the agricultural mind with their great enemy, *Free Trade*. At agricultural semi-political dinners the squire who spoke with contempt of "*guaner*," and pronounced the half-truth that "*there was nothing like muck*," was sure of a round of applause.

But all this has long ago departed; hundred of thousands of tons of artificial manures are used, and it seems, at last, to be the intention of the farmers of the province of Quebec, to follow in the footsteps of their brothers in the older countries. There is no one part of the education of a man intended for agricultural pursuits which demands more sedulous attention than that which teaches him the discriminating selection and the proper use of the different manure-matters submitted for his approval by the merchants who deal in these preparations. The choice is rendered more difficult than necessary by the number of items of which analyses generally consist. Many of these substances are nearly useless, others can be supplied from the ordinary materials to be found on every farm at a much cheaper rate, and the rest are merely *capita mortua*, or "dead-heads." All the *organic* substances, for instance, are only valuable in proportion to the *nitrogen* they contain, the rest of the per centage will not pay for its carriage. Again, though *potash* is a very important constituent of manure, a little consideration will show that, as we send large quantities of it abroad, it can hardly pay to reimport it as manure. If, once more, our gas works send their sulphate of ammonia to England, as they do, it seems to me obvious that the English merchant will charge his profit on any ammonia he may send us in manure, and that it will cost us dearer than what we send away, and the same with our bones and apatite, and their phosphoric acid.

Now these three matters are the only parts of an artificial manure that concern the farmer: nitrogen, phosphoric acid, and potash. With these, alone, the largest crops of grain and green crops can be grown, and I think I can show how the farmer can guard himself from all danger of being deceived in his purchases.

The following is an analysis of an ordinary good manure, containing the three substances I have mentioned in fair proportion:

Soluble Phosphate of Lime	26.00
Insoluble " "	6.00
Ammonia	5.00
Potash (sulphate)	4.00
Water, sand, organic matter in which the nitrogen is contained, &c.	59.00
	100.00

Ammonia is, as I need not tell my readers, composed of nitrogen and hydrogen; and thus, in some analyses, the proportions are given as of so much nitrogen, or as the French still call it, *azote*. Sulphate of ammonia, the form in which it is sold at the gas-works, contains, or should contain, about 25 0/0 of ammonia. Soluble phosphate of lime contains about 61 0/0 of phosphoric acid; and sulphate of potash contains potassium 50 0/0 of anhydrous (waterless) potash. Should you wish to find how much nitrogen is contained in any given quantity of ammonia, divide by 1.214; if the reverse, i.e. how much ammonia can be formed from a given quantity of nitrogen, multiply. Thus 2.5 0/0 of nitrogen is equal to $2.5 \times 1.214 = 3.035$ 0/0 of ammonia; and, again, taking the per centage of ammonia, if we multiply it by 3.882, we shall find its representative in the form of sulphate: thus, $3.035 \times 3.882 = 11,78187$, which, in sulphate of ammonia, is the value of our original 2.5 of nitrogen. The ammonia, multiplied by 5, gives the corresponding amount of *nitrate of soda*; so, if you want to give your land 45 lbs. of ammonia per acre, you must apply 225 lbs. of nitrate of soda.

As to calculating values, we must be guided by market prices. In England, as well as in Canada, the *unit* is taken as a means of measurement. Thus, supposing a superphosphate to contain 26 0/0 of soluble phosphate, it would be worth, at present rates of £2.15 stg. per ton $55 \div 26 =$ two shillings and three halfpence, i.e. 51 cents a unit, and the Canadian ton would be worth $11 76, add $3 for expenses of importation, and you arrive at its cost to the merchant; add his profit at 25 0/0 = $3.50 and the selling price on the wharf at Montreal should not exceed $18.26, *plus* 20 0/0 duty, that is, $2.80; in all $21.00. Ammonia is worth $3.36 per unit, and potash, say 5 cents a pound; our manure then will amount to

Soluble phosphate of lime	26.00	$11.76
Insoluble " "	6.00	1.20
Ammonia	5.00	15.80
Potash	4.00	4.40
Organic matters, Water, Sand, &c.	59.00	0.00
	100.00	33.16

Now this, at the rate of 4 cwt. an acre would be a perfect manure for any crop of the root kind, including potatoes. Doubling the ammonia and reducing the soluble phosphate to 13 0/0 would increase the cost to $43.08, but would make it more suitable for grain, corn, &c.; and after all said and done, wherever farm yard manure is used, I do not believe potash to be at all necessary; so the $4.40 may be knocked off, and we arrive at a most useful general manure at $39.00 a ton, even at prices as they are in England, and if we used our sulphate of ammonia, our apatite, and our bones, at very much less than that. There is no trouble in making it. to every 100 lbs of bones add 60 lbs of brown sulphuric acid at 1.78 gravity, having previously thrown water to double the *bulk* of the acid over the bones. The bones need not be crushed, only in that case the acid will take longer to act. When they are all dissolved, dry them up with any powdered charcoal, ashes, &c, mixing in the potash, if you please; the bones will give 3½ 0/0 of ammonia or thereabouts, and you can add the remaining 1½ 0/0 in gas-works' sulphate.

It was not unamusing, last session, to hear the opinions of one or two gentlemen in the Legislative Assembly on the question of manures. One, who ought to be a better logician than to argue "from particular to universal," protested that, as he had seen some very fine ears of wheat growing in the immediate neighbourhood of a piece of *apatite*, therefore it was advisable to use that mineral, crushed, as a dressing for grain. Another said *ashes* were all that was wanted to restore the fertility of the province.

The question of dissolved versus undissolved phosphates

(1) Very odd! since it is adding ammonia to substances already rich in nitrogen.—A. N. J. I.

is still being worked out in Scotland, and is as far from settlement as ever. While Mr. Lawson, of Sandyford, adduces quite extraordinary testimony in favour of the undissolved, Lord Tweeddale, and Professor Aitken, of the Highland and Agricultural Society, show, in a far more extraordinary degree, the superior value of the dissolved phosphates. As regards our Canadian apatite, when dissolved, the testimony of these experimentalists is of the strongest quality.

Mr. Aitken, who is in charge of the trials, says "The average yield per acre with the insoluble and soluble phosphates is as follows:

	Weight per acre. tons.	cwt.	Average. tons.	cwt.
Ground coprolites	17	5		
Bone meal.....	15	14	14	6
Ground apatite.....	19			
Dissolved coprolites.....	22	4		
Dissolved bones...	20	1	21	6
Dissolved apatite.....	21	13		

Showing an increase with soluble phosphates of nearly 50 0/0. The plot with ground Canadian apatite was *a failure from the beginning to the end of the season*, showing that this hard crystalline phosphate is unsuited for use in the undissolved state even when very finely ground." This is exactly what I said of it in this Journal some months ago

The Woburn Abbey experiments, conducted under the superintendence of Dr. Voelcker, chemist to the R. A. S. of England, seem to prove this: as regards the *wheat crop;* the unmanured plots of one acre each yielded 8¾ bush and 1356 lbs. of straw; with potash, soda, magnesia, and superphosphate, as manure, 11 bush and 1910 lbs. of straw; with the same minerals and 200 lbs. of sulphate of ammonia, 27.3 bush; with the same minerals and 400 lbs. of sulph. am. 31.2 bushels of wheat and 5114 pounds of straw, and the year was, that year of bad harvests, 1879!

In barley the same style of yield occurred: unmanured, 16 bush. per acre and 1450 lbs. of straw; potash, soda, magnesia, and superphosphate of lime, 11 bush. and 1131 pounds of straw; the same with 200 lbs. of sulphate of ammonia, 28.7 bushels per acre and 2513 pounds of straw; and with the same minerals and 550 lbs of nitrate of soda, 37 bushels, and 3024 pounds of straw! As both wheat and barley were the third crop in succession on the same land the yield was very good, considering the year; but the experiments are principally valuable, because they show that Messrs. Lawes and Gilbert were perfectly right when, 40 years ago, they said, in opposition to the purely mineral theory of Liebig, that nitrogen, in the form of nitrates, or as ammonia, was the thing necessary for grain crops. I hope the time is come when we have heard the last of the unscientific notion that *phosphate*, alone, will benefit these crops; it is, believe me, a very perfect mode of wasting money.

Useful factors.

Nitrogen multiplied by	1.214	Ammonia.	equals
Ammonia.....	3.882	Sulphate of Ammonia.	"
"	5.000	Nitrate of Soda.	"
Potash (anhydrous)...	1.85	Sulphate of Potash.	"
Phosphoric Acid, do.	2.183	Phosphate of Lime (tribasic).	"
" " ".	1.4	Soluble Phosphate.	"

And 28·25 price per gross ton: price per ton of 2000 lbs.

Arthur R. Jenner Fust.

The accompanying extract from the report of the Chemist to the R. A. S. of England, Dr. Voelcker, will give an idea of a sham, delusive manure· Observe the seductive "Organic matter"; the "Carbonate of lime" i. e. common chalk; the 25.40 0/0 of water, and the 28.80 0/0 of sand. The real value, supposing the phosphate of lime to be all *soluble*, would be only £2.4, or $11, whereas it was sold at $40. I should like to pull the superphosphate sold as manufactured in Ontario to pieces: anyhow $42 for it is as absurd as anything can be.

"A sample of artificial manure manufactured in Jersey, and said to contain blood, bone, guano, &c., was sent for analysis by Mr. W. M. Jones, Guernsey. The manure had the following composition:

Moisture.....	25.40
Organic matter.....	23.60
Phosphate of lime	6.25
Carbonate of lime.....	11.01
Oxide of iron and alumina, &c.....	4.94
Insoluble silicious matter (sand)...	28.80
	100.00
Containing nitrogen.....	1.80
Equal to ammonia.....	2.19

This manure was sold as "Engrais artificiel" (artificial manure) at £7 10s. in Jersey, or £8 per ton delivered in Guernsey.

The maker asserted that the manure was as rich as Peruvian guano, and more concentrated than in previous years.

It will be seen, however, that it contained only 8¼ per cent. of phosphate of lime, and 2 per cent. of ammonia, in round numbers. On the other hand it was damp, and about three-quarters of its weight consisted of moisture and useless earthy and other matters.

The manure would have been rather dear if, instead of £8 per ton, it had been sold at £3 per ton."

A. R. Jenner Fust.

Remarkable experiment with sheep.

The *Times'* correspondent in Paris writes:—An invitation having been sent to me, I went to Pouilly-le-fort to see some very important experiments on the farm of M. Rossignol, a veterinary surgeon. M. Pasteur, one of the scientific glories of France, made experiments in connection with his latest researches on that malady dreaded by agriculturists, called charbon, a sickness which rages more especially among sheep, the mortality of which produced by it is estimated in France, at several million francs a year. According to Mr. Pasteur's theory, this malady is communicated to animals, and more especially sheep, by infected grass. The grass, however, is only infected where animals that have died of the disease have been buried. In these spots worms, after having fed on the diseased carcases, rise through the pores and fissures of the soil to the surface, collect round the roots of plants, are swallowed by the animals, and thus communicate to them the deadly virus. Mr. Pasteur has collected these worms. He separated the virus they contain, subjected it to chemical action, and gave it a graduated virulence, extending from the most harmless to the virulent state. He then set up the theory that, by inoculating the virus at different progressive degrees, he might eventually inoculate the severest virus without the animals suffering any effect from it. In other words, that by inoculation the animals might be protected from charbon. On the 5th of May, Mr. Rossignol's farm and 60 sheep were placed at Mr. Pasteur's disposal. Ten of these sheep were left untouched in order that they might later on serve for comparison of the remaining 50. Twenty-five were marked with a hole in their ears, and were inoculated the first time on the 5th of May, and the second on the 17th. On the 31st of May none of the inoculated sheep had lost fat, or gaiety, or apetite. On 21st of May the 50 sheep were taken without distinction, and inoculated with the strongest virus. Mr. Pasteur predicted that to-day the 25

sheep not inoculated would be dead, and that the inoculated animals would show no symptoms of sickness. To-day at half-past one a number of spectators, among whom were Mr. de la Rochette, president of the Agricultural Society of Melun; Mr. Patinot, Prefect of the Department; M. Tisserand, director of agricultural matters at the Ministry of Agriculture and Commerce, and several cavalry officers and veterinary surgeons, came together to witness the result. At two o'clock 23 of the sheep which had not been inoculated were dead; at three o'clock died the 24th, the 25th an hour later. The 25 inoculated animals were sound and frolicked, and gave signs of perfect health. This preventative is neither costly nor difficult, for a single man can inoculate 1000 sheep in a short time.—*Ex.*

Shipment of valuable cattle to Canada.

Mr. S. W. Urwick, the Secretary of the Hereford, Herd-book Society, exported in the *Texas*, from Liverpool to Canada, on March 30th, the following cattle, which are to join the breeding herd of Hon. M. H. Cochrane, Hillhurst, Compton, Quebec, Canada, a breeder who has already registered in the Hereford Herd-book:—Five heifers by Sir Isaac 5,598, bought of Mr. Pitt, Chadnor, Leominster, one bull by Regulus 4,076, bought of Mr. J. Price, Court House, three bulls by Ivington Boy 4,662, bought of Mr. Edwards, Broadward; six bull calves by Longhorns 4,711, bought of Mr. Smith, Gattertop, Leominster; five bull-calves by Remus 5,535, bought of Mr. Goode, Ivington Bury, Leominster, fifteen bull-calves by Romulus 5,542, and Blakemere 5,227, bought of Mr. Grasett, Whitmore, Ludlow; four bull-calves, one steer, one heifer, by Romulus 5,542 and Blakemere 5,222 bought of Mr. Fenn, Stone Brook House; ten bull calves and three heifers by Hopeful II. 3,876, Gaylad II. 5,336, and Duke of Gloucester 5,307, bought of Mr. John Hill, Felhampton Court, Church Stretton; and nine cows and heifers — Rarity, Bright Lady, and Delight — from Longner Hall sale. Chief among this choice selection is Mr. Price's grand bull-calf, which is sent out to do service along with President, a bull exported last year to Hillhurst.

The Hon. Mr. Cochrane, whose pedigree Shorthorns, imported in 1877, created such a sensation in this country when Earl Bective and Mr. Loder purchased several of his Canadian bred animals at over 4,000 gs. each, also shipped from Liverpool in the same vessel one of the most valuable consignments of pedigree live stock ever exported from Great Britain. It comprised, in Shorthorns, two Bates heifers and four valuable cows, a number of Jersey and Guernsey bulls, cows, and heifers, selected with great care in the Channel Islands, also forty-five prize Polled Aberdeen bulls and cows purchased in Aberdeenshire. A selection of Shropshire Down sheep, from Lord Strathmore's flock, and 200 Shropshire and Oxford Down sheep, from other noted breeders, are also included; and also two valuable Clydesdale stallions, purchased in Dumfriesshire,

The Hon. J. C. Abbott, of Montreal, sent out by the same steamer three prize Guernsey heifers, and a choice selection of Shropshire Downs, from Lord Strathmore's herd.

Mr. Simon Beattie shipped ten valuable Clydesdale stallions, including Mr. Lawrence Drew's celebrated horses Top-gallant II, and Black Prince, bred by Mr. A. B. Yale. The value of the whole consignment is estimated at over £30,000.

BEET-SUGAR.

The success of beet sugar production in most European Countries has certainly been wonderful; the production doubling itself, in many cases, in four years. The grower, who knows how to cultivate the beets with economy, who secures a fair price for his beets and makes it a point to feed a ton of pulp for every three tons of beets sold must necessarily enrich his land and himself too. The feeding of beet pulp and straw, with a little crushed grain, &c., must necessarily produce an abundance of rich farm manure, which, at a fair price for the beets, should cost the farmer nothing. Of course, beet crops, like all crops, exhaust the soil. But the pulp fed to stock must necessarily return to the soil the elements removed by the beet, *minus* the sugar, when the manure is properly used for artificial manures of the right quality will no doubt help the farmer, by securing better beet crops and more money; but they are not indispensable to the recuperating of the soil.

The Franklin Co. failed from want of capital and experience. Many more companies may, and likely will fail, for the same reasons—but, for all that, there is a fortune in store for the well planned and well managed beet sugar produced in the United States and in Canada. E. A. B.

Ornamental Trees.

Nothing can be more lovely than many villages in the province of Quebec. At first, the cause of their excelling beauty does not strike the mind of the admiring tourist; but upon mature consideration, he discovers that the picturesqueness of these spots is principally due to the taste displayed by their inhabitants in selecting the most ornamental trees for their plantations.

Fig. 1.—Cut-leaved Weeping Birch.

Contrari-wise, other villages, though the buildings that adorn them may be of superior type, have a sombre and lugubrious effect, for want of that repose which, in a landscape, nothing but a mass of greenery can give. In every village, round every habitation, trees should be planted. It is not an expensive process, if certain rules easy of comprehension be followed, and the value of the property will be thereby doubled. I am not speaking of rare trees, which, costly to buy, are often incapable of enduring the rigour of our climate; but I mean our hardy indigenous trees, so lovely in their form, and so varied in their beauty. What more attractive object than our elms, with their branches so gracefully bending back towards the ground? Can anything be more charming than the carven foliage of our maples; more grand than the massive trunks of our lofty limes; more striking than our silver-leaved poplar, when, after a shower, its balsamic odour

"Takes the imprisoned soul
And laps it in Elysium,"

or the sight presented by a grove of fir-trees, after a fall of snow? How the green boughs, decked with light flocks of snow, glitter in the sunshine; bending gracefully their heads,

as if to quietly deposit their load on the subjacent earth There is, believe me, no more delightful sight than a park adorned with bosquets of trees like these.

A list of those trees which grow well in this province may

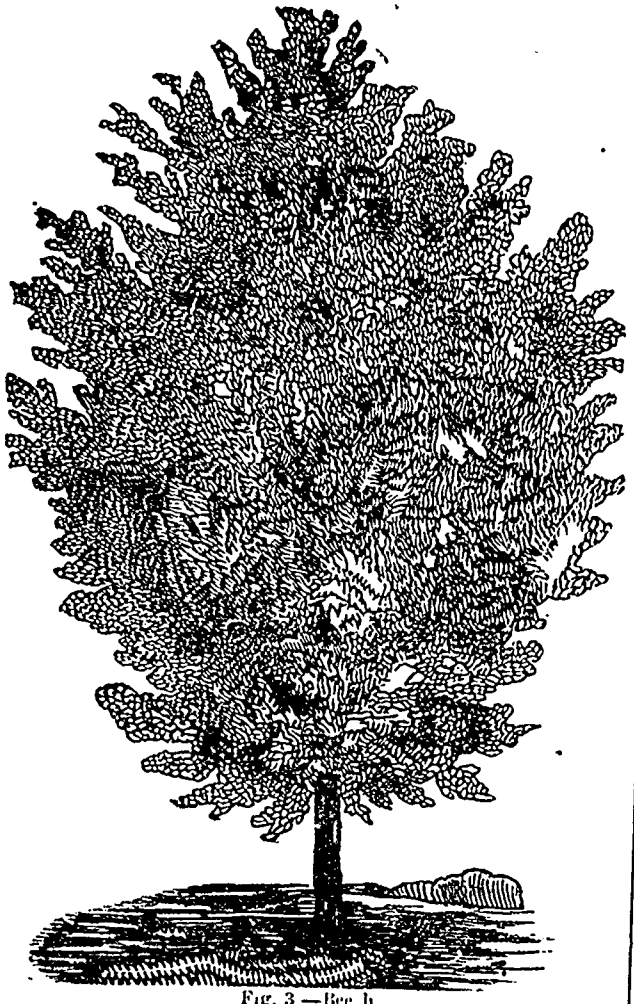


Fig. 3 —Beech.

be seen below. Every taste may be suited, so great is the variety. I have given both the proper and trivial French names. I thought it right to do so, because it very often happens that a tree is known by different names in different places. Thus, our Canadian poplar is sometimes called *liard*, sometimes *léard*; the mélèze (Anglice *larch*), is known as the *épinette rouge*, and sometimes as the *tamarac*, its American name. Some unscrupulous nurserymen speculate on these variations in the names of the different species, and sell as rarities, under their scientific appellations, trees which the deluded purchaser could easily find in the nearest wood.

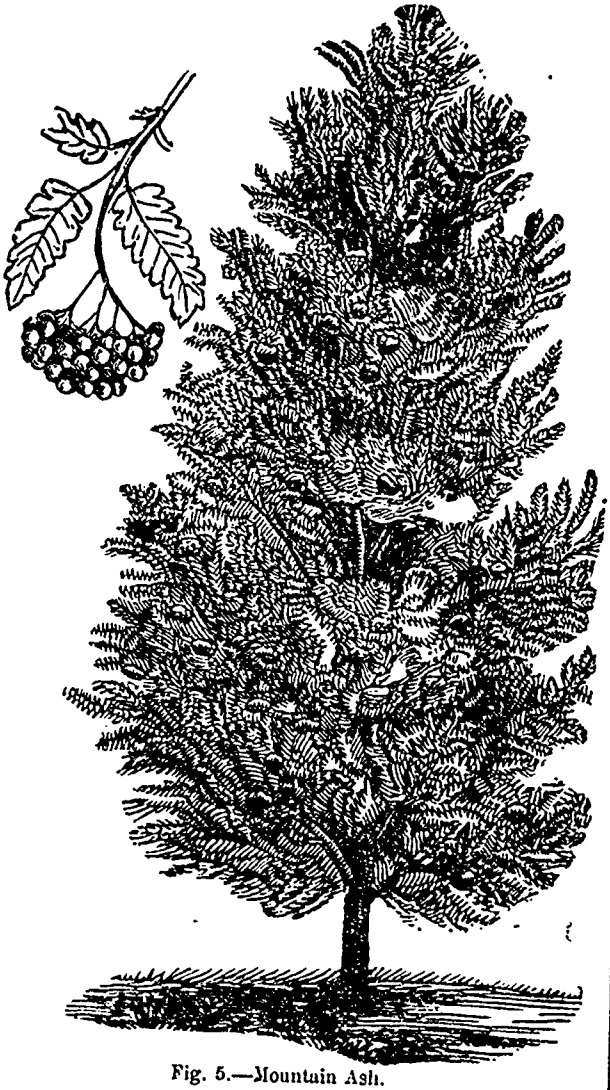


Fig. 5.—Mountain Ash.

In this list, the names to which an asterisk is prefixed designate trees whose hardiness has been tested as far down as 75 to 90 miles below Quebec, and have come triumphantly out of the trial.

DECIDUOUS TREES.

NOMS ANGLAIS.	NOMS BOTANIQUES FRANÇAIS	NOMS VULGAIRES FRANÇAIS.	NOMS BOTANIQUES LATINS.
Poplar leaved birch.	Bouleau à feuille de peuplier.	Bouleau rouge.....	Betula populifolia.....
Canoe or paper birch.	Bouleau à papier.....	Bouleau à canot.....	Betula papyrifera.....
Cut-leaved weeping birch. fi. 1	Bouleau blanc européen.....	.....	Betula pendula laciniata.....
Yellow birch.	Bouleau élancé.....	Merisier blanc.....	Betula excelsa.....
Cherry, black or magohany birch.	Bouleau merisier.....	Merisier rouge.....	Betula lenta.....
Bitter nut Hickory.	* Caryer amer	Noyer dur.....	Carya amara.....
Shell bark Hickory.	* Caryer blanc.....	.....	Carya alba.....
Bignonia Catalpa.	* Catalpa de Virginie.....	.....	Catalpa Bignonioïdes.....
White oak.	Chêne blanc.....	.....	Quercus alba.....
Scarlet oak.	Chêne écarlate.....	.....	Quercus coccinea .....
Iron, post, or box white oak.	Chêne étoilé.....	Chêne gris	Quercus stellata.....
Red oak.	Chêne rouge.....	.....	Quercus rubra .....
Dogwood.	Cornouiller du Canada.....	Quatre-Temps.	Cornus canadensis.....

NOMS ANGLAIS.	NOMS BOTANIQUES FRANÇAIS.	NOMS VULGAIRES FRANÇAIS.	NOMS BOTANIQUES LATINS.
Sugar maple.	Erable à sucre		Acer saccharinum
Silver leaved or white maple.	Erable à fruits laineux		Acer dasicarpum
Swamp or red-flowering maple	Erable rouge	Plaine	Acer rubrum
Sycamore.	Erable sycomore		Acer pseudo platanus
Black or water-ash.	Frêne à feuille de sureau	Frêne gras	Fraxinus sambucifolia
White ash.	Frêne d'Amérique	Frêne blanc	Fraxinus americana
Weeping European ash.	Frêne *pleureur*		Fraxinus excelsior pendula
Red ash.	Frêne pubescent	Frêne rouge ou commun	Fraxinus pubescens
Beech. (fig. 3.)	Hêtre commun		Fagus sylvatica
Horse Chestnut.	* Marronier d'Inde		Aesculus hippocastanum
Ash-leaved maple or box elder.	Négondo à feuille de frêne		Negundo fraxinifolium, Acer negundo.
White walnut, Butternut.	Noyer cendré	Noyer tendre	Juglans cinerea
Black walnut.	Noyer noir		Juglans nigra
White or American elm.	Orme d'Amérique	Orme blanc	Ulmus americana
Red or slippery elm.	Orme roux	Orme rouge	Ulmus fulva *ou* rubra
Large toothed aspen or large poplar	Peuplier à grandes dents	Peuplier	Populus grandidentata
Balsam poplar.	Peuplier beaumier	Beaumier, *tacamahaca*	Populus balsamifera
White poplar. (fig. 4.)	Peuplier blanc	Peuplier argenté	Populus alba, Abele
River poplar, Cotton tree.	Peuplier du Canada	Liard, léard	Populus canadensis
American aspen.	Peuplier faux tremble	Tremble	Populus tremuloides
Lombardy poplar.	Peuplier pyramidal	Peuplier de Lombardie	Populus pyramidalis
Plane tree, Button wood.	* Platane d'Occident	Platane de Virginie	Platanus occidentalis
Locust tree.	* Robinier faux acacia	Acacia	Robinia pseudo acacia
Rose Acacia.	* Robinier rose	Acacia rose *ou* nain	Robinia rosea
European white willow.	Saule blanc européen		Salix alba
Yellow or golden willow.	Saule jaune		Salix vitellina
Kilmarnock weeping willow.	* Saule pleureur de Kilmarnock.		Salix caprea pendula
Mountain Ash. (fig. 5.)	Sorbier d'Amérique	Cormier, *Mascouabina*	Sorbus americana
Lime tree. (fig. 6.)	Tilleul d'Amérique	Bois-blanc	Tilia americana

CONIFERS EVER GREEN, EXCEPT THE LARK.

White spruce.	Epinette blanche		Picea alba
Norway spruce. (fig. 7.)	Epinette de Norvége		Abies excelsa
Black spruce. (fig. 11.)	Epinette noire	Epinette jaune	Picea nigra
" "	" " (variété)	Epinette de savane	" "
Red Cedar. (fig. 8.)	Génévrier de Virginie	Cèdre rouge	Juniperus virginiana
American black larch.	Mélèze d'Amérique	Epinette rouge, *tamarac*	Larica americana
White *or* Weymouth pine.	Pin blanc du Canada	Pin blanc	Pinus alba canadensis
Yellow pine. [fig. 9.	Pin doux	Pin jaune	Pinus mitis
Red, Pitch or Norway pine.	Pin rouge		Pinus rubra
Hemlock.	Pruche du Canada	Pruche	Tsuga *ou* Abies canadensis
Balsam fir.	Sapin beaumier	Sapin blanc	Abies balsamea
Double balsam fir.	Sapin d'Amérique	Sapin rouge	Abies americana
American arbor vitæ Witch	Thuya d'Occident	Cèdre blanc	Thuya occidentalis

cedar. (fig. 10.)

Willows have the advantage of rapid growth, which recommends them to those desirous of procuring shade in a short time. The *weeping willow* is highly ornamental. The engraving (fig. 2) will give a good idea of its habit of growth: as the poet sings;

> Where the weeping willows lave
> Their dank branches in the wave,
> See thy hopeless lover's grave.
> Fair Eliza!

The sole defect of our glorious, world-known maples, is their slowness of growth; but this arises chiefly from a mistaken fancy of planting trees of 12 or 15 feet high, instead of as many inches. We have here, at Varennes, soft maples taken from a nursery and planted out only 7 years ago, which already girth from 15 to 25 inches.

The Elm and Ash make fine objects on a well kept lawn. They, too, are slow of growth. A few poplars and willows planted among the tardy trees will afford shade sooner, and may be removed when no longer required for that purpose.

Deciduous and evergreen trees should always be planted together. The fir and the Norway spruce grow rapidly and brighten the landscape in winter.

The engravings which accompany this article show, clearly, the regular and natural form of the trees they represent. Many of those who are fortunate enough to have trees on their property destroy all their beauty by an unskilful use of the shears. Trees should, almost invariably, be left to themselves; and should only be pruned when they seem inclined to go astray from the proper form.

Conifers should on no account be touched. Nothing can be more attractive than a fine fir or spruce, with its branches garnishing the trunk to the very ground—nothing more cockneyfied than the same tree with its trunk stripped of the limbs for a third of its height, by the too frequent and barbarous use of the unpoetic axe.

If we must prune, the principle to be kept in view is, that single trees should be, in shape, oval, and masses of trees, pyramidal. Evergreens in masses should invariably retain their branches to the very ground.

One word as to planting. I strongly advise my readers to plant their trees when small, as they leave the nursery, if possible.

A young tree has every chance in its favour; it accommodates itself to the soil, to the position it is placed in, and suffers less from removal.

Shortly, I will give my readers instruction how to plant. At present, it is enough to say—plant, and by planting,

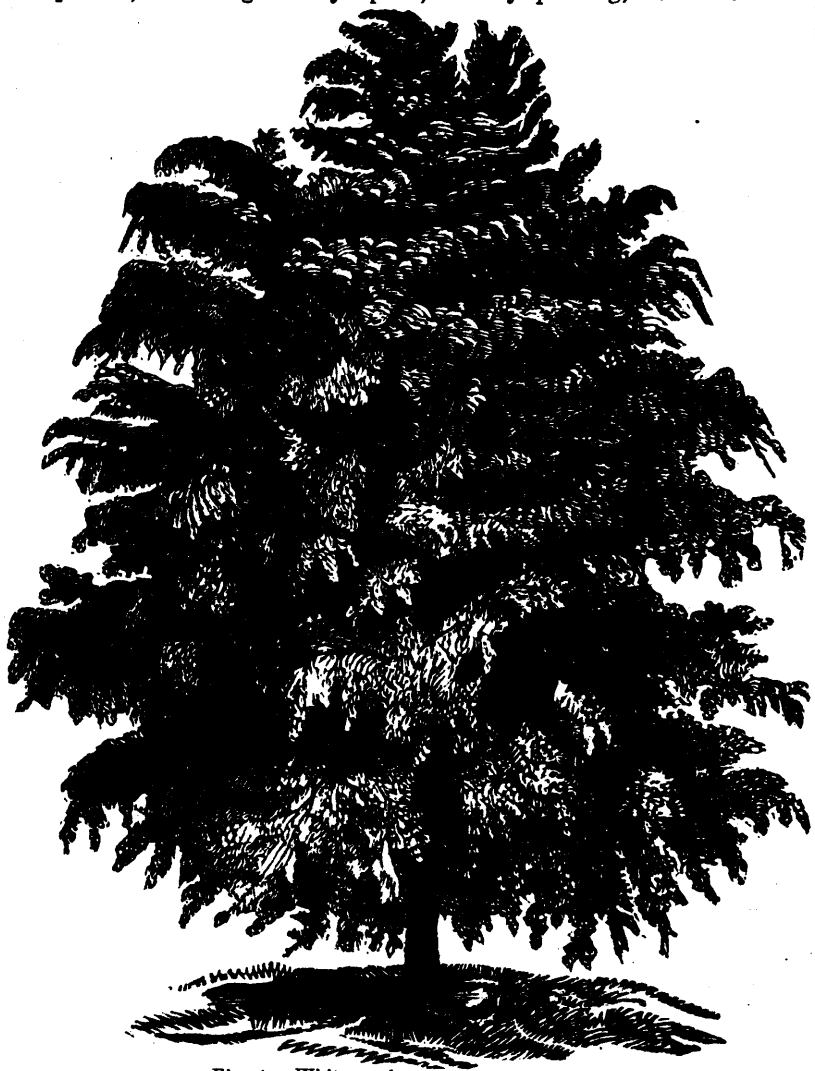


Fig. 4.—White poplar.

embellish your dwellings. Let the poor hide the nakedness of their houses by the luxurious verdure of our shrubs, and let the rich add to the beauty of their abodes by surrounding them with the most magnificent specimens of our forest trees.

I am indebted to M. Auguste Dupuis, nurseryman of St. Roch des Aulnaies, for much information as to the relative hardiness of certain species. When a tree has borne without injury the rigour of the climate in which he lives, there is no doubt as to its resisting the winters of the western part of our province. J. C. Chapais.

On virulent diseases, and especially on the disease commonly called Chicken Cholera.

By M. Pasteur.

Evidently, the excrements of the diseased chickens have most to do with the contagion. Nothing would be easier than to prevent the spread of the disease by isolating the chickens for only a few days; by washing the poultry yard with plenty of water, and particularly with water containing a little sulphuric acid, which kills the germ of this disease. The excrements should be carried off to a distance. After a few days, the chickens that are still alive could be brought together again with perfect safety, because this disease is so rapidly fatal that in a short time all the diseased animals would be dead.

If the cultivation of the infectious organism in chicken broth is repeated many times over, passing from one cultivation to the next by sowing an infinitely small quantity, such as may be gathered on the point of a needle, the virulence of the germ is not weakened by the process. This is analogous to the ease with which it multiplies in the bodies of the *Gallinaceæ*. This virulence is so great, that the inoculation of a minute fraction of a drop will cause death in two or three days, and most generally in less than twenty-four hours.

Having established these preliminaries, I now come to the most important portion of this communication.

By operating certain changes in the process of cultivation, the virulence of the infectious germ may be much lessened. This is the vital part of the subject. I beg the Academy's permission to withhold a description of the processes by means of which I determine this diminution of virulence. My object is to insure independence in my studies.

The diminution of virulence is seen in cultivations by a slower development of the infectious organism, but, in reality, the two varieties of virus are identical. In the first or very infectious state, the inoculated germ may kill twenty times in twenty. In the milder state, it may twentv times in twenty give rise to illness, but not to death. These facts have an importance which is easily understood, as they allow us to form an opinion, in this particular disease, of the problem of its recidivation or non-recidivation. If we take forty chickens, and inoculate twenty of them with the very virulent virus, these twenty will die. If we inoculate the other twenty with attenuated virus, these will all be ill, but they will not die. We let the twenty chickens be entirely cured, and then if we inoculate them with the very infectous virus they will not die. The conclusion from this is evident. The disease is its own preventive. It has the character of virulent disease, which do not recidivate.

Let us not be astonished at the singularity of this result. All things are not here as new as they appear at first. In one important particular, however, there is a novelty which will be pointed out.

Before the time of Jenner, who himself practised this method, as I have already mentioned, there was a practice of inoculating variola to preserve from variola. In our day, sheep are inoculated with murrain to preserve them from murrain, and cattle are inoculated with peripneumonia to preserve from this fearful disease. Chicken cholera shows us an immunity of the same kind. It is an interesting fact, but it does not show any theoretical novelty.

There is, however, an important novelty in the preceding observations, a novelty which gives food for reflection on the nature of virus. It consists in this, that we have here a disease whose virulent cause is a miscroscopic parasite, which may be cultivated outside of the animal economy. The virus of variola, the virus of vaccine, those of glanders, syphilis, the plague, &c., are unknown in their nature.

This new virus is a living organism, and the disease to which it gives rise has one thing in common with virulent diseases, properly so-called, a quality heretofore unknown in virulent diseases, caused by microscopic parasites: it is that it does not recidivate.

The existence of this disease is a connecting link between virulent diseases caused by a living virus, and other diseases, in the virus of which life has never been recognized.

I would not have it believed that the facts present the constancy

and mathematical regularity which I have mentioned. To believe this would be to ignore the great variability in the constitution of animals, taken at hap hazard from among domestic animals, and also the variability in the manifestations of life in general. The very virulent virus of chicken cholera does not always kill twenty

Fig. 6.—Lime tree.

times in twenty. Sometimes this virus only kills eighteen times in twenty, but generally twenty times in twenty. We may also remark that the virus, when re- -d in virulence, does not save life twenty times in twenty. Sometimes this happen only eighteen times in twenty, and even sixteen in twenty. Neither is it an *absolute* preservative by one inoculation. We may more surely prevent recidivation by two than by one inoculation.

If we compare the results above stated with what is known of vaccine and its relations to variola, we may see that the less vigorous organism which does not cause death, is analogous to a vaccine, relatively to the one that kills, for it gives rise to a disease which may be called mild, as it does not cause death, and, at the same time, it preserves from the disease in its most deadly shape. What other condition must this organism fulfil to be a true vaccine like that of cow-pox? This condition is that it should be a definite variety, and that we should not be obliged to prepare it *de novo*, when we wish to use it. We find here the same difficulty which presented itself to Jenner. After he had demonstrated that inoculated cow-pox is a preservative against variola, he thought that it was necessary to start from the cow-pox of a cow. Jenner soon discovered, however, that he could get along without cows, and make vaccine pass from one arm to another. We may try to do the same by causing our germ to pass from one cultivation to another. Under these circumstances, will the germ become actively virulent or will it remain moderately so? Although this may appear very astonishing, I can say that the last supposition is the correct one. The virulence of the germ, in the small number of cultivations which I have attempted, has not increased, and everything seems to point to the existence of a true vaccine. I may even add that one or two trials favour the idea that the attenuated virus keeps its character of mildness after passing through the bodies of Guinea pigs. Will the same thing happen after repeated cultivations and repeated inoculations? Only by experiments can such a question be answered.

At any rate, we now know of a disease caused by a microscopic parasite, which may be obtained in such a condition that it does not recidivate, as other diseases caused by similar parasites. Moreover, we have a variety of its virus, which behaves towards it as vaccine towards variola.

The Academy may allow me a digression worthy of attention. From what has been said, we can easily obtain chickens affected with the disease called *chicken cholera*, in which death is not a necessary consequence of the disease. We may then witness as many cases of cure as we may wish. Now, I do not believe that experimental surgery has ever met with more curious phenomena than those which are present when the animal returns to health, after inoculations have been made in the large pectoral muscles. The germ of the disease multiplies in the substance of the muscle as it would in a vessel. At the same time the muscle swells, hardens, and becomes bleached at the surface and below the surface. It becomes filled with globules of pus, but does not suppurate. Its histological elements are easily torn, because the parasitical germ is scattered through them in numerous pockets, and it feeds on a portion of their substance. I will, later on, exhibit coloured figures showing the disorders caused by the parasitical germ in case of cure. The parasite is gradually arrested in its development and disappears, while, at the same time, the portion of muscle which has been attacked unites, hardens, and lodges itself in a cavity whose surface resembles that of a healthy granulating wound. The portion which has suffered from the disease finally forms a sequestrum, and is so well isolated in the cavity that holds it that it may be felt by the finger under the skin, and by the least incision, it may be seized with forceps and exacted. The small wound left in the skin heals immediately, and the cavity is gradually filled by the renewed elements of the muscle. I will now place some of these demonstrations before the Academy.

I have now to close by an explanation relating to the non-recidivation of the disease which occupies our attention. Let us take a chicken thoroughly vaccinated by one or more previous inoculations of the enfeebled virus. What will happen if we inoculate the same chicken again? The local lesion will be insignificant, while the first inoculations, and, in particular, the very first, had been the cause of such marked change in the muscle, that a large sequestrum can be easily felt by the touch. The cause of the difference in the effects of these inoculations is to be found entirely in a greater relative facility of the development of the germ of the disease at the first inoculations, and, in the last inoculation, in the development being either entirely wanting or very feeble and promptly stopped. The consequence of this seems evident, and it is that the muscle, which has been seriously diseased, has become, even after it has been cured, unfit for the cultivation of the germ of the disease, as if this germ, by a preceding cultivation, had suppressed some principle which life does

not bring back, and whose absence prevents the development of the microscopic organism. I have no doubt that this explanation, to which we are led by palpable facts in this case, will be found to be generally applicable to all virulent diseases.

It must appear superfluous to point out the principal consequences of the facts which I have had the honour to present before this Academy. There are, however, two of these which may be mentioned. One is, that we may hope to obtain artificial cultivations of every virus, and the other is, the idea of obtaining vaccines of the virulent diseases which afflict humanity, and which are the greatest plague of agriculture in the breeding of domestic animals.

(Communicated by Dr. Girdwood.)

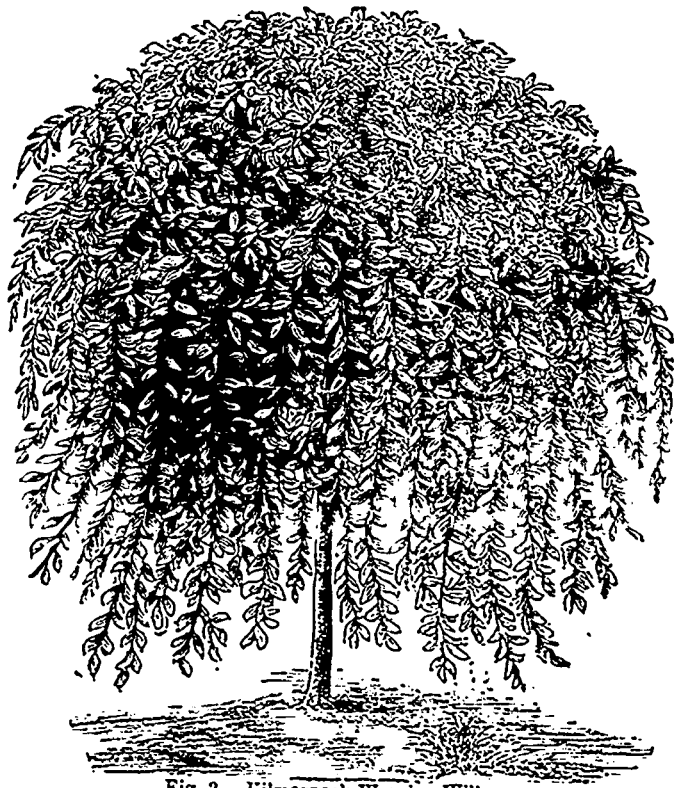


Fig. 2 —Kilmarnock Weeping Willow.

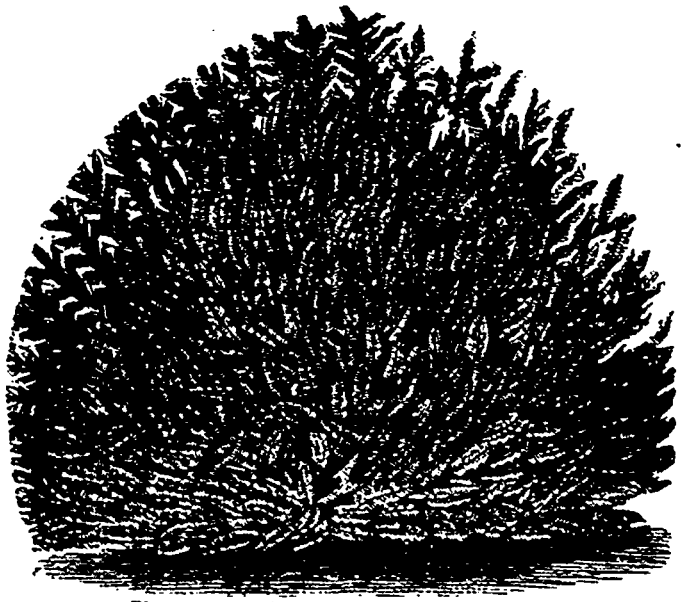


Fig 10.-- American Arbor vitæ—White Cedar

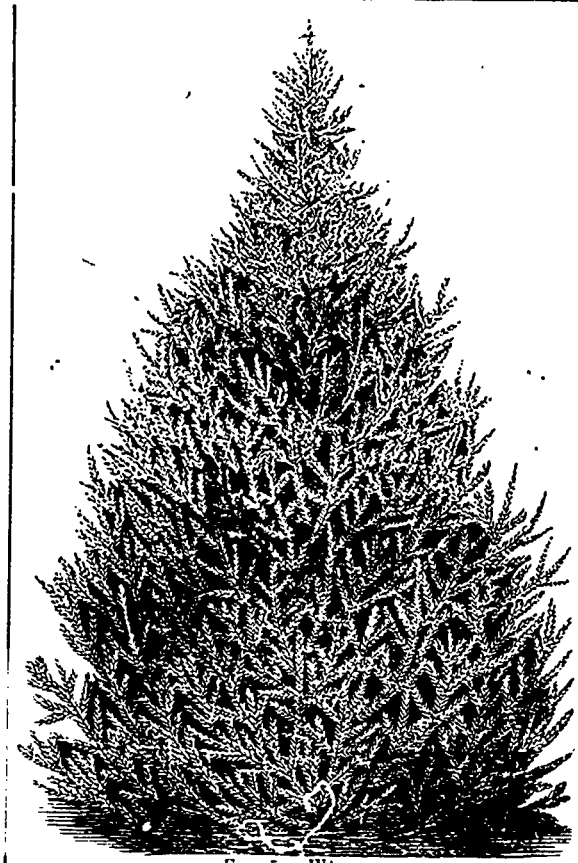


Fig 7 —White spruce

Fig. 8.—American Black Larch.

Prickly Comfrey Cheap Spring food for cattle.

Sir.—Living on the edge of Dartmoor, where good pasture grass is always difficult to get; and in backward seasons like the present one is absolutely unattainable, I last spring tried the experiment of planting about three-quarters of an acre of my light peaty glebe, with Prickly Comfrey, only taking care to clean the ground thoroughly, to place the plants about a yard apart each way, and to put a good spadeful of stable dung at the bottom of each pit. I must confess to having been somewhat disappointed at the result. The plants came up strong and vigorous enough, but only some of the cattle would touch it, and with those it seemed rather a relish than a staple article of food, and it did not appear to save anything else. I tried making hay of it, as I had seen recommended, but I found it an

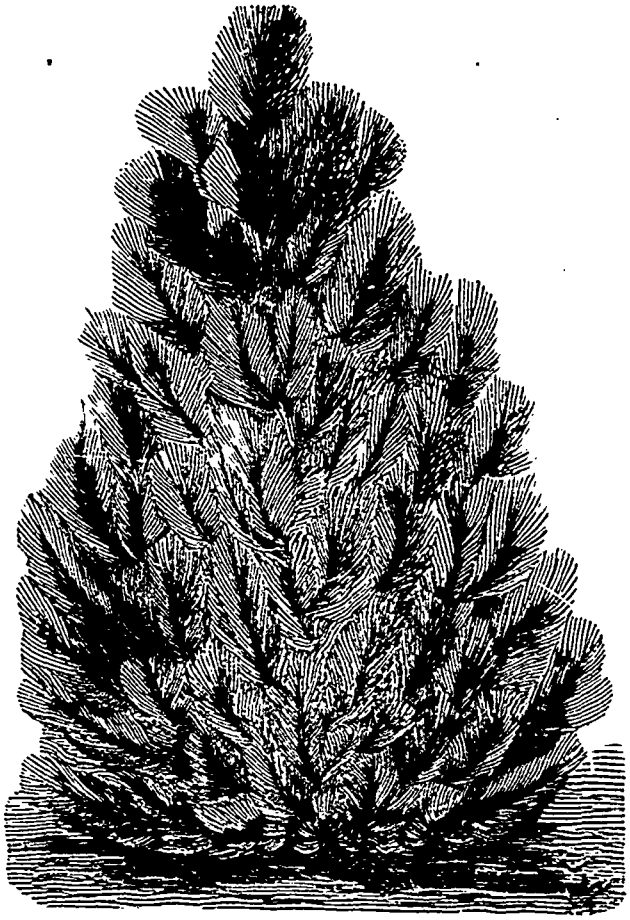


Fig. 9.—White or Weymouth Pine.

utter delusion; and from the nature of the plant, consisting largely of water, I believe it must always be so.

This spring, in spite of my having neglected to give the plants a good mulching of stable litter to protect them from the frost, they again came up early and strong, and gave promise of a most abundant yield; but the old difficulty of knowing what to do with it again recurred, and I began to think my man had been in the right when, coveting the piece of ground, which is close to the stable, for some other purpose, he had told me that "he only allowed me to keep that 'trade' [the Moorland word for rubbish] one season more."

Now, however, all is changed. The end of the maugold, which we were pulping to mix with our chaff, loomed close at hand, whilst the coming in of vetches or any other green food looked a long way off in the cold dry easterly winds Then a new idea struck us. We brought two large handcart-loads of the luxuriant young comfrey leaves up into the hay-loft, we laid them in the trough of the chaff-cutter, with about equal quantities of hay and of forage (i.e. of oats cut before the corn is ripe enough for thrashing out), and we cut up all together; then we left the large heap to welter for two or three days upon the floor.

The result is that we now have an abundant supply of sweet moist food, which every cow, calf, and horse eats with the utmost greediness, literally licking out their mangers, lest a fragment of the leaf should escape them; and which, with the aid of a little decorticated cotton cake, will render us independent of all extraneous aid till summer is fully come. I may observe that the cook, who knew nothing about the cow's change of food, at once remarked upon the improvement of the butter both in colour and in texture.

For the benefit of those who think that price and value must always keep pace together, I must add, then, I planted part of the field with dear comfrey (8s per hundred for roots, and 12s. for crowns), and part with cheap comfrey, at, I think, 15s. per thousand; and that now both lots are of precisely equal value (though they differed so widely in price), and both are all that can be desired.

Instead of holding with Mr. Mechi (page 250), that each farm-horse consumes the produce of six average acres of arable land, I find, by experience, that by liberal tillage I can keep, in first-rate

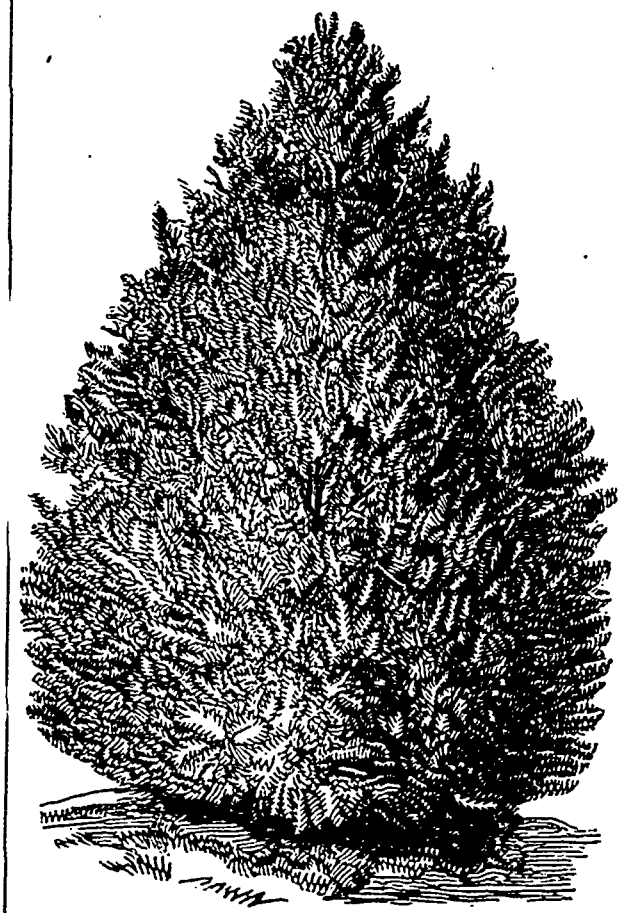


Fig. 11.—Black Spruce.

condition, at least a dozen animals (three horses, five cows, and four calves) on the produce of about nine acres of light soil, enjoying the great advantages of natural drainage and plenty of sunshine, as they lie on a good bed of granite with a good slope to the southward. The estimated value of the glebe is about £1 an acre.

Not keeping any sheep myself, I find that the sum paid for feeding off the spare swedes goes a long way towards supplying the necessary cake for the cows, besides greatly improving the land; and when the long expected roof is put over the dung-hill, I reckon that the sale of spare potatoes, for which peaty land is admirably suited, will more than cover all outlay upon artificial manures.

I think it is every man's duty in these hard times to give his neighbours the benefit of such practical experience as may enable them to tide over the present distress by making one blade of grass do the work of two, even if they cannot always "make two blades of grass grow where one grew before," and I am sure that our plan of freely mixing comfrey with chaff for spring cattle feeding will be an immense boon to many who cannot afford the apparatus and the labour required for steaming the food for their cattle.

F. Gilbert White, (The Revd.).

Lewsden Vicarage, Ashburton, April 26th.

Sheep-Dog trials at Millom.

Certainly the largest and best exhibits of dogs yet held in connection with this Society were those brought together in New Market Hall on New Year's Day, 1881. The proceedings were opened in the morning with a trial of working Sheep-dogs, in which 15 competed. The judges were Messrs. W. Lewthwaite, Broadgate; H. Caddy, Rougholm; and W. L. Benn, Hexham—all practical agriculturists. Three sheep—a Herdwick, a Scotch, and a half-bred—were allotted to each dog, and were let out from a pen on the top of a hilly field, the man and dog standing at the bottom, and out of sight of the sheep. A signal, by flag, was given to the man, when he sent up the dog to find and fetch the sheep down to him. This was a piece of work in which most of the dogs failed. The sheep usually made for the gate by which they had been driven into the field, got into the corner, and as the dogs could not see their masters, or receive instructions from them, most of them failed to dislodge the sheep, and were crossed out. When, however, they took down the sheep, they had then to drive them through a gap in the fence into a second field, thence along this for about 150 yards, through another gap into a third field, and then recover them, and bring them back to the end of the second field, were a pen of open hurdles, with a narrow entrance, had been erected, and place the sheep in the pen. Only two out of the fifteen dogs succeeded in penning in the allotted time—eight minutes—and one of these was disqualified, as it twice bit the sheep. Most of the dogs were also noisy during the work. The first prize bitch was greatly admired for her sagacity. "Go fetch," said her master, and she soon brought the sheep to him, keeping at a safe distance, never close enough to make them break, ever watchful, yet kind, conciliating, not forcing. The second prize, Mr. Newby's Guilty, worked very nicely, but the sheep were wild at the pen, and although two were penned in the stipulated time, they got out again whilst the dog was recovering the third.—*Live Stock Journal, (Eng.)*.

A singular disease.

SIR.—You would confer a very great favor upon many of your readers if you could inform them as to the probable nature of the disease which is raging among cattle in this vicinity, and indicate an effectual modo of treating the same. Of late, cows and horses have been dying in large numbers in and near our village of a very strange disease which proves fatal generally in about 24 hours. Cattle affected by this disease become feverish and tremble as though they were cold; their hearts beat quickly and loudly, their eyes stick out of the head and shine as glass; the skin, especially on the back, sticks tightly to the bones; they become very constipated or the very opposite, and what they pass is of a dark color and very fetid. They appear sore all over and do not like to be touched. They continue to eat and to drink, especially to drink, as they appear very thirsty. There are indications of poisoning. Could it be that they ate poisonous weeds in this dry season when pastures are very bare, and they graze mostly along a river below a large tannery? Are wild parsnips or carrots poisonous to cows? Will cows eat them?

CHARLES BROUILLETTE.

New Glasgow, Q., July 9th, 1881.

Your description corresponds closely with the history of one form of the disease known as *anthrax* or charbon. This is a disease which is due to a specific poison, which, entering the body from without, sets up the disease, and each new case forms a centre of infection. You will best combat the disease in the mean-time by preventative measures, 1st, by having all the carcases of the animals which have died buried seven or eight feet deep, or, which is better, burned; and 2nd, you will change the pasture land entirely, and have that now used ploughed deeply. You will do well to consult personally on the land with the best veterinarian within reach.

CORRESPONDENCE.

Sir.—Will you permit an "Old Agriculturist," who has retired from the independent life of a farmer, and who is now an interested observer of current events, to offer a few remarks on subjects which particularly interest agriculturists in the Province of Quebec.

Just now there is a considerable degree of excitement on the "Beet Root" question, and the cultivation and manufacture into sugar of that valuable production of the soil.

Like all others in this country, I am quite ignorant of the process and profits of sugar making. In France, Germany and other European countries, it has been tolerably successful; the expectation of those who are engaged in its introduction into Canada, will, I trust, be realised. I must confess, however, regarding the movement from a farmer's stand point, I have my doubts as to the *ultimate* benefit to the grower. I do not question the suitability of the climate and soil, to produce good crops of the beet-root. I believe that, with *abundance of manure*, and *good cultivation from the beginning to the end*, fair average crops may be realised, which will help to fill the pockets of the producer for the time being, and which would be satisfactory, if the thing could be repeated year after year.

To grow the beet well, the ground must be in a high state of cultivation, manured unsparingly, and the crop attended to, so long as the drill harrow can be safely used; hand hoeing and thinning are indispensable to success.

I take it for granted promoters of the movement will have the farmers instructed in its culture, otherwise miserable failures will be the result and the whole thing will collapse.

The farmer who lives within a moderate radius of the mill, has every advantage over his more distant neighbor: his cartage is less, and he can readily use the refuse after the extraction of the saccharine matter. I have no knowledge of the value of such refuse for cattle food, nor how far it may be turned to account to recuperate the soil after its deterioration on growing the crop.

The beet, like other root crops, tends to exhaust the land, while it prepares it for the subsequent production of grain and grass in rotation. In the absence of experience, I should fear that in a few years the soil would require manure, far in excess of that produced on the farm, and that the deficit must be made good by the purchase of artificial manures. My old fashioned ideas as to stock feeding the whole productions of the farm except grain, may prejudice me against the growing of the beet root.

It is premature to offer an opinion on the project or to attempt to foretel the result. Let us hope for the best, and use every effort to forward the agricultural interests of our country. A free discussion on all subjects concerning the cultivation of the soil, cannot fail to be beneficial. We want light, let us have it.

I observe the forced sale of "the Franklin Beet sugar manufacturing Co.'s" property, is advertised at Boston.

AN OLD FARMER.

Sir—The readers of your journal in this county have been much pleased by your articles on the protection of insectivorous birds, and especially by the able letter of l'Abbé Provancher which appeared in your April number. I trust that you will still continue to keep the subject before your readers, as it is only by impressing the farmer with an idea of the value of their birds that we can hope to see them saved from the gun in the hands of the farmer's boy.

I see by the papers, that in the Montreal district, Mr. Gailley has secured quite a number of convictions, and the birds there are now very well protected. By a little care, the magistrates throughout the Province could put a stop to the shooting and so save the country large sums of money.

I may relate a case which came under my notice this spring, which shows with what ignorance the farmers treat these birds, and I have no doubt but that hundred of similar cases have occurred.

A farmer in the county of Argenteuil, whom I am in the habit of visiting, two years since planted a young orchard near his house. This spring, on again visiting him, I found all the trees dead. On asking him the reason of this, he replied that, these ——— wood-peckers had killed his trees, that he had shot as many of them as possible, but still could not prevent them from picking at the collars of his trees. I at once broke a tree-shoot off, showed him the tracks of the Apple Tree Borer in the wood, and explained to

him, that if he had left the creeping wood-pickers alone, they would have taken the borers out and saved his trees. I am glad to say that he immediately saw the truth of my remarks, and in future he and his boys will leave these birds alone. C. E. T.

Como, Argenteuil Co., June 20th.

Dear Sir.—I am sending you an article, on the cultivation of turnips, as it may be of interest to some of our Canadians farmers that have no success with their turnip crops. I have been informed that there are some farmers in Lower Canada that have left off trying to raise turnips altogether. I have never failed to raise a good crop of turnips, and I have carried off the first prizes for the best turnips every year but one since the exhibition has been held here.

I will first begin with the preparation of the land. The manure should be carted on the land as soon as possible after harvest and spread out as evenly as possible; it should be allowed to remain in this state until it has had some rain, so as to wash some of the liquid into the surface soil; then it should be ploughed in about four inches deep and no deeper, then in the spring as soon as the land is dry, it should be ploughed six or eight inches deep and the same width so as to mix the earth and manure as much as possible, then it should be harrowed on the 5th on 6th day after, and as soon as there is vegetation it should be ploughed again. I always plough my land in the spring three times before I make the drills, because the oftener the land is ploughed the sooner vegetation commences, then as soon as the land is in good order it should be put up in drills 30 inches apart; if the land is wet or heavy the drills should be well raised, then the sun will warm up the land much sooner and start growth at once. If the soil is sandy, the drills should not be raised very high, if they are, they will not hold any moisture, and if the weather should turn dry, the turnips will not have sufficent moisture to keep up their growth; this is oftentimes the cause of the failure to get a good crop. Some prefer to put the manure in drills, that is a very good plan if the manure is well rotten, but if the manure is what is called green, that is manure that is fresh made, the straw is not half rotten, if it is put in drills it will help to keep the land dry, and it will not decay to give any nourishment to the roots. This, sometimes, is the cause of the failure to get a crop, if it is a wet season and the land is low, a fair crop may be expected, but it is uncertain. There are a great many farmers do not understand how to sow turnip seed; they are afraid to sow it deep, say from 1 inch to 1½ according to the weather, if wet 1 inch will do; this is the proper depth to sow turnip seed; some will tell you that turnip seed should be covered with as little earth as possible. I have seen some farmers in Canada sowing their turnip seed, and they put so little earth to cover the seed that half the seed was not covered at all, still they expected to get a crop, but the turnips did not come up, only in some spots; and they were not deep enough sown to get sufficent moisture to hold out against the fly, and the dry weather, so the fly took them all. Then, some sow them over again, and some will say that they never *could* get a crop of turnips! I always sow my turnip seed 1 inch to 1½ deep according to the weather, with a drill machine or seed-drill.

There are a great many farmers that sow by hand, by making a small mark along the drills; that may do if they are made deep enough, and the seed sown by hand, then take a rake and use the back to cover the seed, do not be afraid of covering it too deep. I will explain why turnip seed should be sown deep. Some times when the drills are made and the seed sown, there is sufficient moisture to start growth, but dry weather sets in, and the drought gets below the tender roots; the hot sun and fly is too much for them; for a day or two they will be at a stand still, then they will begin to disappear gradually until there are none left, and of course the fly is blamed for the whole loss. Now if the seed had been sown one inch deep, before the leaf gets above ground the root is down one inch below the seed, and if the weather is dry and, the hot root will find sufficient moisture to continue its growth; then they will soon put out the second leaf, they will conquer the fly, and a crop of turnips is certain. About the 20th of May is a good time to sow Swede turnips, that is if the land is in good order, they will get a good start before the fly appears. A great many farmers do not sow seed enough to the acre: for the sake of saving 50c. on the seeds they will lose their crop. I always sow 4 pounds per acre, as every farmer will find the thicker turnip seed is sown, the faster they will grow: they shade the ground, and protect themselves from the fly. A. R. J. F.

Hoeing is another important point. When the turnips are 4 inches high I hoe and thin them, 9 or 10 inches apart is the right distance. Some farmers are afraid to use the hoe to thin their turnips; they thin them with their hands, a very bad rule, as they are never sufficiently thinned; they are oftentimes only 4 or 5 inches apart: men that are used to hoeing turnips seldom or never put their hands to them to thin them. The turnip is a root that should be kept free of weeds, as the weeds exhaust land more then crops do.

Buying is another very important point; every farmer should buy seed from good and trustworthy seed-merchants, as it depends a great deal on the kind of seed you sow to have a good crop. It is well known that some seed-raisers grow all kinds of seeds in a small farm. If swede turnip seed and white turnip seed, cabbage, cauliflower, rapeseed, are grown near to each other, they are not as pure as if grown on a farm by themselves. Of course the small nursery merchant will undersell the larger ones so as to get sale for his season's crop of seeds.

My dear sir, you must not think for a moment that I am under the impression that you are a book farmer, as I have watched your writting for some time, and I always have been, under the impression, that you must have been a practical farmer, as you appear to have, a thorough knowledge of farming in all its branches, or you could not have written as you have (1).

(1) Thank you, very much.—A. R. J. F.

I should very much like to meet you this summer, should you pay a visit to the county of Ottawa, you will find me at the well known Victoria farm, where you will be made most welcome. Be sure to call if you can.

I am superintendent of the Victoria farm, and head depot for G. B. Hall & Co. of Quebec.

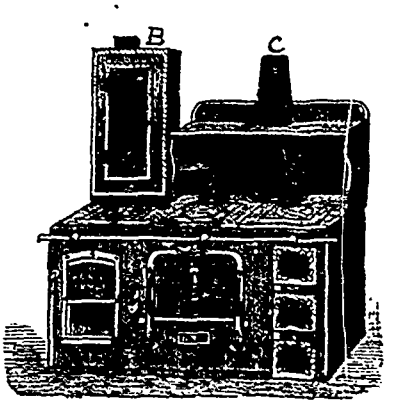
Should you meet Dr. Duhamel M. P., he will give you a little information about this place, as he is a friend of mine.

My next letter will be on harvesting grain.

I remains yours sincerely,

Rd. Bowden.

Arthur R. Jenner Fust, Esq



Economical House-heating Apparatus.

We give herewith a drawing of Messrs. Burns and Gormley's latest improvements in the onction of their combined Kitchen range and hot water furnaces. We understand that the system has been applied with complete success even in extensive mansions. Our experience of many years has been so satisfactory, on a smaller scale, that we think it right to commend it to all interested in the matter. These ranges, large and small will no doubt be fully shown at the coming Provincial Exhibition.

There is a good deal of talk about ploughing in clover Now a crop of clover of a ton and a half ought to be worth all expenses paid, $9 00: that sum will buy at least 20 bushels of bone-dust, which will thoroughly manure 1¾ acres of land for turnips. I prefer the bones.