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OFFICIAL PART.

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The Formation of a Breed of Horses in the Province of Quebec.

I am indebted to M. C. F. Bouthillier, Bleury, Ste-Thérèse de Blainville, for the translation of M. Turenne's article on horses, and for the remarks thereunto attached. A. R. J. F.

The Haras National of the Province of Quebec has to deal with a most frightful jumble of the most incongruous elements, in the shape of the native horse population as at present existing in this Province. Canadian horses here, now, have neither symmetry nor quality, not can they boast of any well marked characteristics; about all that can be said of them is that they are endowed with a large amount of hard-

iness and vitality, having generally sound limbs and cast iron constitutions. The latter qualities are no doubt due to influences of soil and climate. They are also generally speaking remarkably good trotters.

The old Canadian horse, whom everybody has heard of, and so few have seen, is practically extinct in the province. He came originally from Normandy (we believe that he came from La Perche, from which province most of the first settlers sailed), and we have lately found proof positive of the correctness of our impressions on this subject, after a long search amongst the Archives of the Ministerial office of Commerce and Industry and the French colonies. (1) His descendants are more likely to be met with, at the present day, in Vermont and New Hampshire than in the land of birth of his ancestors, the Province of Quebec, where the promiscuous crossing of all known varieties of breeds has been going on in the most reckless manner for a long time. To create a typical Canadian breed out of such incongruous elements is not as difficult a task as it might seem at first thought, if the breeders will only work intelligently with the Haras and put their shoulder to the wheel. Without this assistance, this Company can only have a crop of foals annually in the different counties where their stallions have stood, and a certain amount of judicious instruction with respect to the treatment of promising colts ; with the exception of Montreal, there are no fixed head quarters, where it would be possible to continue to carry out in each succeeding year the good work already begun ; that time will come probably when the Government men who have given it their protection and assistance will have noted the first results obtained. At present, the farmers who will be willing to carry out the following method of procedure will co-operate as much, or even more than the Haras, in its patriotic work. This work is the creation in the Province of Quebec :

1. Of a fast trotting powerful draught horse, full of hardiness and high spirit, as well as strength.

2. Of a type of carriage horse, similar in elegance of shape and hardiness to the French Anglo-Norman and with a trotting gait, more nearly resembling that of the American trotter in rapidity of pace.

1. The creation of a powerful, fast trotting draught horse.

The Haras hopes to succeed in attaining this result, by the crossing of Percheron stallions, which are animals of a fixed type, whatever may be said to the contrary, and thoroughbred, (English) stallions, on the native mares of the Province. Let us take for an example, Eventail 32195, a Haras Percheron, an exceptionally good animal, who made the covering season of 1891, at St. Michel de Bellechasse, under the excellent care of M. F. Pouliot.

Eventail, pure bred Percheron = 1, is crossed on a common mare = 0, of the county of Bellechasse, $\frac{1+0}{2} = 0.50$.

First generation.—There will be foaled in 1892 a half-bred Percheron = 0.50. If this foal turns out an exceptionally good one, and proves his good qualities not by any means by taking prizes at exhibitions (where only too often, fat and roundness of outlines render correct judgment very difficult) but by his actual performance, on the road, on the land, and in the ordeal of hard work of different kinds, in which he may have proved his stamina, and from which he has emerged scatheless, his owner may, if he chooses, keep him for the reproduction of his species. He must in that case, obtain from the special commission appointed for that purpose, a certificate of registration of his stallion in the Haras Stud Book. But it must be remembered, that the model half-bred will not turn up more than five times out of a hundred, at the outside.

All the other colts should be castrated. I insist most strongly on this point, because owners are a great deal too much inclined to believe that any half-bred Percheron, Clyde, or Shire, &c., is good enough for a stallion, and their neighbours are only too much inclined to bring him their brood-mares.

If this first foal is a filly, when old enough, her owner should mate her with an exceptionally good half-bred Percheron. $\frac{0.50+0.50}{2} = 0.50$.

2nd generation.—The produce obtained, if it turns out to be a very good colt, may be kept as a stallion, which will not happen oftener than two and a half times out of a hundred.

If he is only an ordinary colt, as will happen 97 and a half times per cent, he must be cut.

If it turns out to be a filly, and that she takes after the sire, she can be mated with a pure Percheron, or, $\frac{0.50+1.00}{2} = 0.75$ = three parts pure blood. If she takes more after the mare, she must be mated with a pure Percheron. These things must be left to the intuitive intelligence of the breeder. With the produce of Eventail, for instance, a Percheron very close in breeding to the Anglo-Percheron, it would be necessary, to be much more cautious in having recourse to thoroughbred blood, than in the case of Joly, a Percheron weighing 2000 pounds.

3rd generation.—The produce of the half-bred Percheron brood mare (2nd generation) by a pure Percheron if it turns out to be a colt, might be kept for a stallion in an average of 7 or 8 times per cent, as well as the produce of the similarly bred brood-mare, by a thoroughbred stallion.

4th generation.—If a filly, in either case, must be mated with a $\frac{3}{4}$ or half-bred Percheron of undeniably good quality, and the resulting horse-foal will be the proper foundation stallion for the desired typical breed, the new Canadian breed, which is destined to do so much for the fame and pecuniary benefit of the Province of Quebec.

No more crossing in this case, with the Anglo Norman, the Clyde, the Shire, the St. Laurent, &c., &c. Avoid like the plague any race alien to that of your crossed one. Otherwise, you would destroy in a moment the work of four generations, and you would fall back again into chaos and darkness, at the moment of emerging into light. Too much cannot be urged on this point.

It may be remarked that in following the same method with the Clyde, excellent results can also be obtained.

The aid and assistance, afforded by the thoroughbred horse, in the matter, will be explained at length, in the work which we are getting ready. It may be explained here briefly, that a strain of thoroughbred blood is introduced with the object of uniting as much speed as possible with the maximum of strength of the draught-horse.

The breeder must not allow himself to be restricted by invariable rules, with the exception of avoiding any cross from any other race, except from that one from which he originally started. He must however know what he wants, and use his discretion and intelligence in setting about getting the kind of horse he wants.

Rome was not built in a day, one single generation will not give us the desired result. Do not be discouraged by the uneven, badly shaped, unfinished looking specimen—crosses of the first generation. The shock of two stranger breeds, coming into collision, takes place there, and the result obtained is often very mediocre. But be patient : if you abandon this unformed attempt at a new creation, everything will fall back again into chaos; you have merely created a state of extreme pertubation in the new world, and you will never arrive at

(1) The descriptions of this breed and of the one which the Haras National proposes to establish with the help of the more intelligent breeders, will be given in a book, which we have now under way : "The Canadian Horse of yesterday, and the Canadian Horse of to-morrow," and which will be sent to all those desirous of obtaining it.

any perfected result. One might as well invest fortunes in lottery tickets, shut one's eyes, and wait for what turned up.

And, this is, unfortunately, what has been done, and is done here, very often in this Province, where excellent stallions have stood, time and again.

If on the other hand, you are willing to persevere in your attempt, what a lordly recompense shall you not receive for your troubles and your sacrifices. Fusion takes place, blood become assimilated, shape and type become apparent little by little, and after a while, lo and behold the descendants of these first crosses, once so jeered at, bring money to the stable.

Your neighbour, the man who breeds for the sake of breeding at hap-hazard, the wiseacre who doesn't believe in pedigreed stallions whose service fees cost more than a dollar, will bring to market for sale a horse which he will sell for $60, and which it has cost him $70 to breed and raise.

It is also very necessary that breeders should get into the wholesome habit of always asking for the proof of the origin of the different stallions travelling the country. "So your horse is a pure bred Percheron, show me his certificate of registry; he's a ¾ bred Percheron? what is his number in the Haras Stud Book? You say that he is a Clyde, show me his certificate of pedigree."

Since it has been opened, more than 10 owners have tried to get registered in the Haras Percheron Stud-Book stallions that were only Percheron in name, or whose only claims were on ancestors lost in the gloom of ages.

As to the carriage horse, which the Haras hopes to breed by the aid of Anglo-Norman and cross-breeding, we shall have something to say about it shortly.

We may say in conclusion, that one of the best means of improving a breed of animals, is the quality of the rations upon which they are fed, and the feeding of grain to horses. As the Arab Sheik, who ceded to us (he would never say sold) the stallion El Kebir, who afterward made a name in Colorado, used to say in his Oriental style: "If I hadn't seen his dam, I should have said that he had been engendered by oats."

R. Auzias Turenne,
Director of the Haras National,
Member of the Society of *Les Agriculteurs de France.*
(*From the French.*)

A few Comments on M Turenne's Article.

The old Canadian horse had a very sound constitution and very sound legs. This does not apply to the horses we now have here. On the contrary, they are not particularly hardy in constitution, by any means, and they are particularly unsound in limbs. My French-Canadian farmer, who is a good judge, tells me, and I believe that he is not far wrong that, on the Grande Côte between here and St. Eustache, about 6 miles, there are not half a dozen absolutely sound working horses. Mr. Morris, an old resident of Ste. Thérèse, who has given me leave to use his name, assures me that, 40 years ago, the horses about here were ever so much better than they are now, and that to his certain knowledge, they have been deteriorating steadily ever since. I do not believe in any very large draught breed for use on farms, not even in England, least of all, of all places, on farms in the Province of Quebec. Of all the large breeds, such as Percherons, Shires, Clydes and Belgians, I like the Belgians the least, and the Percherons, if very good of their kind, the best. But this proviso must always be retained, I would rather have a good sound Shire or Clyde, than a second rate or unsound Percheron. As to the Percheron being a fixed type, that is quite certain, and they are I think an older breed than either Shire or Clyde. (1) On March 9th 1878, Mr. Frederick suggested the establishment of a Stud Book for Shire-bred horses. That is not so very long ago. The Anglo Norman, or French coacher is a thoroughly good horse. He might be styled a sort of enlarged Hackney, formed by putting English thoroughbreds and Norfolk trotters to large Normandy mares, and breeding from the produce. They are in my opinion far superior, when the best of their kind, to the Cleveland bay, or any other coaching breed, with which I am acquainted. But, as to improving within a reasonably short space of time, the mongrels we have at present, to such an extent as to be able to breed from selected crosses, two typical type reproducing breeds, and to do this by using nothing but Percherons and Normans, would be about as difficult and as Sisyphus-like a task, as one might well wish to attempt; more especially as, Mr. Turenne remarks, the Haras can do so little without the intelligent co-operation of breeders.

Fifty per cent of the mares here are small and light, but, better made than the larger ones, which are, as a rule, exceedingly badly shaped, three cornered, coffin-headed brutes, bred from a half-bred Clyde, or a weedy trotting horse, in the first instance perhaps, and then bred from again without the slightest consideration of the fitness of similarities, and the unfitness of dissimilarities, into which somebody, I forget whom, has summed up the whole mystery of breeding. Because some breeders have advocated the use of large stallions and small mares, in order to increase the size of a breed, citing the facts that in mammalia generally the male is larger than the female, both in a wild and a domesticated condition, and that the female regulates the size of the fœtus, some of the people who started horse-ranches in the West, now more than 10 years ago, conceived the happy idea of getting size on one side, Clyde stallions, and quality on the other, *bronco* mares, a large portion of whom I may add are very much better shaped than our Canadian ponies, and expecting to get an amalgamation of both in the first cross. Although, an occasional instance of a very short, thickset horse, on very short legs, appeared, a sort of diminished and rather improved Clyde on a pony's legs, the general results were so deplorable that they changed their minds and procured stallions and mares better suited to each other. They have all of them, had to begin over again and in consequence of various mistakes of this kind, and this is the reason why the horse-ranches, except in one or two instances, have not yet sent us down any horses for sale. All this I know from cowboys on the ranche.

In *The Field* of March 12th which I have just received, there is an account of a visit to the Percheron Stud Farm Cheyenne, in Wyoming, over the initials G. B.

He says: "the sires were mostly imported Percherons, but "that they do not seem capable of producing something uni-"form from the different breeds. In any case, they do not "suit small well bred mares of which there are so many in "America."

The argument that the use of Clydes has been so successful in Chateauguay and Huntingdon counties, will probably be adduced. Now, I think it must be altogether unlikely that that had nothing but small French-Canadian pony mares, when they began draught-horse breeding, there. They must either have started with some big mares, or they must have been at it a good deal longer than is generally supposed, and a good deal longer than it would be desirable to wait, before the improved Canadian horse-types make their appearance, for to my certain knowledge, the horses there were just as

(1) The Clyde has notoriously been crossed with the Shire.
A. R. J. F.

big, and there were as many of them there, 20 years ago, as there are now.

The truth of the matter is that while all extremes should be avoided, if there has to be an excess of size, it is better, for several reasons, that the female should be larger than the male.

Like begets like, or the likeness of some ancestor, but as it is quite impossible to suit exactly every kind of mare, individually, the best that can be done, is to reduce them into as few similar classes as possible, and provide stallions for each class. Now the Haras has, at present, nothing but Percherons and Normans, neither sires would suit the fifty per cent of small mares in the Province.

It is quite impossible to breed size and quality all at once. If general improvement of shape and action, without very much attempt at much increase in size should be sought for only, in the first cross, at the same time, increased size, to a certain extent, will almost always be obtained even in the first cross.

Increasing the size of a pony breed of horses, without losing the hardiness, superior activity and strength in proportion to size, peculiar to pony breeds, has long been thought of as a great desideratum in England, but it has never been much attempted by putting large sires to pony mares, and whenever so attempted it has failed.

The Haras National absolutely requires for the successful carrying out of its scheme, one of a great national benefit, if properly carried out, a reasonable number, of smaller stallions for mating with the small mares, such as small thoroughbred ponies, if they can be got reasonably enough. They are now very dear in England, Barbs, Arabs or Hackneys, under fifteen hands. Even then, there will remain the absolute necessity for some repressive legislation, as the intuitive perception of the breeders, to which M. Turenne refers, and without which he truly says, they cannot do much, will indeed prove a broken reed to rely upon.

C. F. BOUTHILLIER.

CORRESPONDENCE.

Tushingham House, Waterville, P. Q.
March 15th 1892.

A. R. JENNER FUST ESQ.

Dear Sir,—Having been in England for 3 months this winter, I had a lot of reading to do on my return in the shape of agricultural papers in order to keep up with the times. Looking over the November No. of the Journal I notice a paragraph headed "The Pro. Ex. of 1891," in which you refer to my fire, and that none of my herd competed. You were right in one sense with regard to my herd not competing, but the cattle that Mr. Smith exhibited were raised by me and sold to him the year previous, as I did not see the good of fitting up a herd to compete against a neighbour and, practically, against my own cattle. The bull you refer to as the best you had seen for years was young Tushingham 2nd, that I took 14 first prizes with in Ontario and Quebec, and was by my old bull "Tushingham". What I am writing to you for is to say that I am still in the business, in spite of the fire, and have 16 head, and if you hear of any one who wants males or females of the Hereford breed, please refer him to me.

Yours very truly WALTER M. VERNON.

DEAR JENNER FUST,

I send you the English of a translation by M. H. Nagant, in the French edition of *Journal d'agriculture* for March.

"The London Live-Stock Journal" lately published an engraving, which we reproduce herewith, of the pure-bred Arab stallion "Speed of Thought," belonging to Capt. W. A. Kerr, and bred by the Gomassa tribe of the Anezah.

"He was a dark, rich chesnut without white, save a star. One of his eyes had been knocked out by the point of a lance in a *razzia*.(1) Height 14.3, girth 72 inches, measured 8½ inches below the knee, and stood on perfectly shaped feet, tough as the nether millstone. He was possessed of superlative quality from head to heel, of great muscular development; sinews clean and hard as pin-wire, and stood fair and square on the best of limbs and joints. High couraged, as proved when he beat the famous horse Long Trump by a short head after a desperate race; full of what the Americans term 'vim'; a strong vigorous galloper, his bold, free and jaunty walk, quite up to five miles an hour, being the theme of general admiration. Across country, though somewhat headstrong, he was as clever as a cat, and would face anything, no matter how big, how yawning, and on parade bore himself bravely as became his ancestry. Great depth through the heart, strong shoulders, a muscular neck with marked breadth in front of the withers and immediately behind the ears, denoting long-staying and weight-carrying power."

N. B.—*Alezan brulé* is the French for dark chestnut. Such names for colours, as blond, *brun castor*, &c., are known only to French Canadians.

Vim, not *vis*, is the term used by Americans. Of course it is incorrect, as far as latin goes, it is the horsy expression in use among them.

B.

Extraordinary Potatoes.

A priest, a great lover of agriculture, has brought us a sample of potatoes, of its own growing, the sets of which cost him $4.00 a bushel. These potatoes are excellent in every respect. We have had some of them cooked and can testify that they are of the finest quality. Their shape is perfect. In fact this new variety, which will be designated in future as *Syndicate No.* 1, may be considered from all points of view as a most valuable acquisition.

This variety yielded 400 bushels an *arpent*, on two arpents planted, and without any unusual cost of cultivation. We are convinced that in a good potato-year, this yield may be increased by taking every possible care.

In order to increase the diffusion of this excellent variety, we have made the necessary arrangements for its distribution at a dollar a bushel, sack included, delivered at Quebec. Our correspondent will address them properly, and put them on the cars or steam-boats going to Quebec, without additional charge. Orders may be addressed to us, *with the price by post-office—or registered letter*, and we will take upon ourselves to see to their despatch.

Orders will be executed as soon as navigation opens; but we advise those of our readers who wish to try this new variety to give their orders as soon as possible, since the quantity for sale is not large. First come, first served.

(*From the French*). ED. A. BARNARD.

Choice seed for sale.

We request our correspondents who have choice seed for sale—of any description—to have the kindness to send us samples; and to give us all necessary explanations about them, in order that we may give our readers due notice of where they are to be obtained.

(*From the French*). ED. A. BARNARD.

Tree dealers and their methods.

The methods adopted by dealers in nursery stock are not so conducive to the spread of the science of horticulture as

(1) Hence our word for a foray: "Raid." A. R. J. F.

might be desired, as they too often lead to disappointment and disgust.

They usually have their place of business at or near the boundary lines, to give the impression that their trees are of Canadian growth, whereas, the larger proportion are imported from warmer latitudes and are not suited to the climate.

Some guarantee their stock to be "first class," when a good deal of it is the culling of the large American nurseries which can be bought at a very low price, and bears no comparison with the really first quality supplied by respectable firms.

Agents are instructed to insist upon their customers signing an order and promise to pay on delivery, and if the goods are delivered on to the premises of the purchasers, they have no redress, except by a tedious process of law which few care to risk.

There are some dealers who prefer agents with no previous knowledge of the business—and offer premiums, and other extra inducements to the one who can sell the most of any variety which carries the most profit. Thus, persons are persuaded to buy articles which are entirely unsuitable, for the purpose of swelling the agents' returns.

The prices charged, especially on ornamental trees, shrubs, and small fruits, are out of all proportion to their real value. These prices cover the agents' expenses and cost of delivery, it is true, but the purchasers pay, in some cases, five times as much as they could obtain the same article for, even although they paid freight- or express-charges. Even this extortion might be endured, if the article sent was calculated to give profit or pleasure, but, in too many instances, this is not the case.

The method of delivery is not the best for the successful transplanting of trees and shrubs. They are packed into large cases including all orders for a certain district. These are taken out by a delivery agent, carted round, often without any packing on their roots, and delivered to the buyers.

The roots of trees should never be exposed one minute longer than is necessary. Trees should be packed immediately they are dug, in the nursery from whence they are to be supplied and forwarded to the customer direct, by the quickest mode of conveyance, and it is better for him to pay the cost of freight then, than to have it charged several times over on the first cost of his goods, and then not receive them in a satisfactory condition.

If agents going round were a fair means of fostering the taste for horticulture in the public mind, the effect would be good, but as things are managed at present the reverse is the case.

The community, whose love for the science and practice of horticulture is disappointed and disgusted, suffers; the legitimate nurseryman's business is injured; and the confidence of the purchaser is impaired.

This cannot fail to be the case when men are sent to give instructions on a subject their employers do not care for them to understand, and whose only real object is to make sales regardless of consequences.

The good work of real enthusiasts in the cause, such as the late lament C. Gibb, Dr. Hoskins, W. Fiske, Dupuis, and many others is thus rendered in a measure abortive, and the time, means and talents they have employed in the good cause wasted.

The question then arises: can anything be done to remedy these evils? and are they of sufficient importance to warrant any action on the part of the executive?

To the latter, the mere statement that by a moderate computation no less or more than from $25,000 to $30,000 are annually expended in the purchase of useless trees and shrubs by the uninitiated, should be a sufficient answer.

As to the former question, it might be suggested, that an inspection of all the nurseries and of the best orchards in the province should be made by a competent person, and reports thereon submitted to the Council of Agriculture, and the information thus derived should be freely disseminated throughout the Province. GEORGE MOORE.

It would, I think, be wise if people who are about to buy trees or shrubs would refuse to take any without a written guarantee, 1. that the subject is true to name of variety, and, 2. that it is grafted on hardy stock.

I remember giving dire offence to a farmer not 100 miles from St. Césaire, by refusing to recognise the fruit of a certain tree as *a pear*, i being, in truth, *an apple*. The variety was an old, well known English one: *the pearmain*, and the rogue pedlar had passed the tree off on the innocent farmer as what the latter sought for: *a pear*. A. R. J. F.

How are Nitrogen and Phosphoric Acid to be Obtained in the Cheapest Way?

II.

The following is a continuation of the translation (for which we are indebted to Messrs. H. and E. Albert) of a lecture on the above subject recently delivered by Professor Paul Wagner, Ph. D., Director of the Agricultural Research Station, Darmstadt:—

If you will look at Table IV., you will see how well defined the exceptionally luxuriant development of the plant is, more especially in the case of oats, when the cultivation had been preceded by a green manuring of plants, such as lupins, peas, &c., in combination with phosphoric acid and potash dressings. How, on the other hand, no increase of yield resulted from a preceding green manuring when a non-leguminous plant as buckwheat was selected for the purpose.

I will place before you in this case also the yields of corn.

The cylinders contain:—

No 1 — 92 grams to 3.2 oz. of oat grain
Obtained without green manuring
No. 2 —375 grams to 13.1 oz of oat grain
Obtained after manuring with 30 grams = to 1 oz. Chili saltpetre.
No. 3 — 70 grams to 2.4 oz. of oat grain
Obtained after a green manuring with mustard.
No 4 —416 grams = to 14.6 oz oat grain
Obtained after a green manuring with vetches.
No. 5 —323 grams = to 11.3 oz. of oat grain
Obtained after a green manuring with lupins.
No 6 — 53 grams = to 1.8 oz. oat grain
Obtained after a green manuring with buckwheat.
No 7.—440 grams = to 15.4 oz. of oat grain
Obtained after a green manuring with peas

These results show distinctly to what a high degree the yield can be raised by manuring with potash and phosphoric acid combined with a green manure cultivation, provided that we employ as the green manuring crop, not mustard or buckwheat, but a leguminous crop (vetches, serradella, lupins, peas, &c.); plants, therefore, capable of taking up the atmospheric nitrogen and enriching the soil with that element.

Where mustard and buckwheat were employed for green manuring, and where any result has been observed from this manuring, it is only to be ascribed first to the fact that the soluble nitrogenous compounds of the soil which, otherwise, would have been lost by sinkage during the winter months, have been retained in the surface soil; secondly, to the enrichment of the soil with organic matter; and thirdly, to the beneficial effect produced by keeping the soil covered with

vegetation. Good results of any consequence can never be obtained by green manuring with non-leguminous plants; preference must in all such cases be given to the cultivation of the actual nitrogen accumulators, the leguminous plants.

The foregoing results of my experiments demonstrate to you what great results can be obtained by green manuring cultivation under favourable conditions, and in order to show how it is possible to obtain the same end as is enunciated in the experimental results, in practice, and under local conditions of the soil, climate, and weather, &c., and on a large scale in extensive farming operations, I am going to draw your attention to an example, furnished from the estate of Dr. Doblinger on the Weibelshof, near Darmstadt, with which I have come in contact in the course of consultation.

The estate is farmed without stock, and the nitrogen required for the nitrogen-consuming plants (cereals, rape-seed, turnips, potatoes, &c.) is supplied without exception by green manuring cultivations, for which purpose a mixture of vetches and peas is sown in the cereal stubble, and is manured with potash and phosphates. I have ascertained that last autumn not less than 100 to 200 centners of dry organic matter (2 to 4 tons) per acre, with not less than 200 to 300 kilos of nitrogen per hectare (178 lb. to 267 lb. per acre), was produced on the different fields by such green manure cultivation; consequently, more nitrogen than that required by the plants (the cereals, potatoes, turnips, rape) which follow the green manuring to yield a maximum harvest.

This is a formidable result, and similar results have already been obtained on numerous other estates. Just consider the great advantage obtained by such green manuring cultivations. On the one hand, the small outlay for vetch and pea-seed may amount to 30 marks per hectare (about 12s. an acre), to which may be added about another mark, or 1s. for sowing and reaping. On the other hand, a gain of 100 to 200 centners (about 5 to 10 tons = 2 to 4 tons per acre) of dry organic matter, with no less than 200 to 300 kilos (about 440 lb. to 660 lb. = 178 lb. to 267 lb. per acre) of nitrogen, corresponding in value to about 20 to 30 centners (about a ton or ton and a half) of Chili saltpetre (nitrate of soda). The phosphoric acid and potash manuring would be required any way for the chief crops irrespective of the green manuring, and therefore the cost of the potash and phosphates must not be included in calculating the expense of the latter.

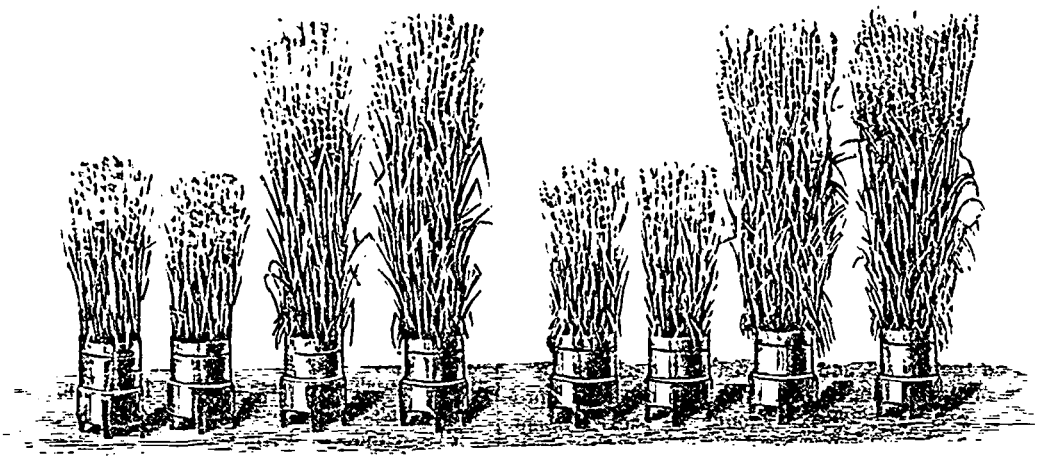
We have, therefore, recognised in the store of nitrogen in the atmospheric air a treasury in which lies an incalculably great wealth for agriculture, and from which it is our problem to learn how to help ourselves most freely. What we have to do is to entrap the atmospheric nitrogen, to retain it as much as possible for leguminosæ and non-leguminosæ for all cultivated plants, to make the greatest possible use of it, and to obtain the greatest value from it.

And a further treasury lies in the nitrogen in the soils of moorlands, more especially the low lying moorlands. Not less than from 1 lb. to 2 lb. or 3 lb. of nitrogen are contained in the dry moor substance, and if we regulate the water supply on moorlands, raise the amount of chalk in them sufficiently, add potash and phosphoric acid in sufficient quantity, then the store of nitrogen in the moorland soil is rendered accessible to plants, and rich harvests of potatoes and herbaceous plants, grasses, and fodder vegetation will be obtained where, for long periods, hungry cattle could find nothing but sterile patches and inferior meadows covering the land.

Therefore, the lesson for husbandmen is, briefly:—

Abundant potash and phosphoric manuring and eventually also lime manuring for the leguminosæ—the plants which enrich the store of nitrogen in the soil—in order to raise them to the condition for absorbing their allotted abundant quota of nitrogen, and for producing the subsequent luxurious development: distribution of potash and acid phosphates in the cattle stalls, so as to prevent the volatilisation of that atmospheric nitrogen which has already been transferred to the stable manure: abundant potash and phosphoric acid manuring, also for the non-leguminous plants—the plants which consume the nitrogen of the soil—to enable them to utilise to the fullest extent, to elaborate thoroughly, and to produce the largest amount of organic subtance from the air-nitrogen, presented to them through farmyard manure and green manur-

TABLE IV.—GREEN MANURING EXPERIMENTS WITH OATS.



Potash and Phosphoric acid, *no* nitrogen.

Potash and Phosphoric Acid, *no* nitrogen. Lupins were grown the previous autumn and buried while green.

Potash and Phosphoric Acid, *no* nitrogen. Buckwheat grown the previous autumn and buried while green.

Potash and Phosphoric Acid, *no* nitrogen. Peas grown the previous autumn and buried while green.

ing, and also from that nitrogen which stands at their disposal in humus soils and moorlands.

The knowledge that the immeasurably great and inexhaustible store of nitrogen of the air can be rendered accessible, either directly or indirectly, to all farm plants, and the knowledge that phosphoric acid and potash are, as it were, the entrappers for the atmospheric nitrogen, phosphoric acid and potash being the means of opening for us the storehouse of nitrogen of the air and of moorlands. It is such knowledge which has gained for the potassium salt deposits of Stassfurt, for the calcareous and soluble Thomas phosphate, and for the products of the superphosphate factories an importance which we could not even anticipate; and if it be true that the store of combined nitrogen existing in form of Chili saltpetre, in the west of South America, will cease to exist within a conceivable period, then we ought to look with true consolation on the still inconceivably large potash deposits, and on the phosphate mines, and on the phosphate lying in phosphoriferous iron ore which is placed at our disposal in form of Thomas slag; for with the help of these we can open up the inexhaustibly rich storehouse of nitrogen of the air and the rich stocks of nitrogen of moorlands.

With this I terminate my remarks on the question :—How is nitrogen to be obtained as cheaply as possible?

(To be continued.)

Nitrate of Soda

The price of nitrate of soda this year, Mr. Evans, McGill Street, Montreal, tells me he cannot put lower than three dollars a 100 lbs., in bags of 300 lbs. each. A. R. J. F.

POTATOES.

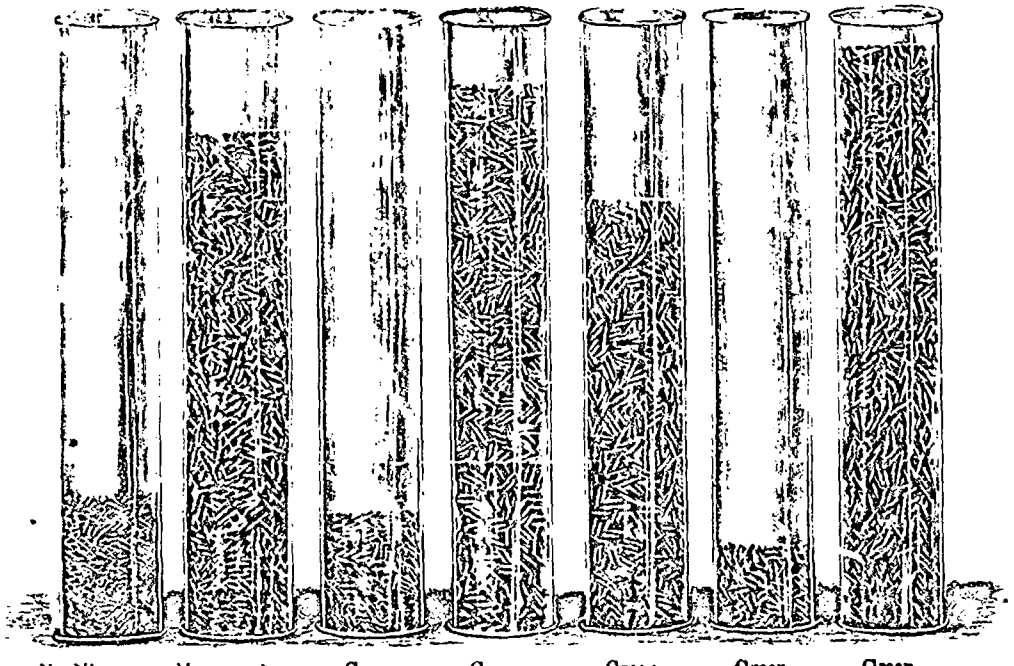
From all I hear, I am inclined to think a great breadth of land will be planted this year in potatoes. As it is some time since I wrote extensively on this plant and its cultivation, it will not seem, I trust, to be going over old ground again superfluously if I give some general ideas as to the preparation of the land and the selection of seed likely to answer on the various soils of the province.

Soils —The potato is not a tuber adapted to heavy clay soils: sandy loams; black, peaty land, if limed, suit it better. Good crops of fair quality may be grown on heavyish loams, if large dressings of strawy farmyard dung be used, accompanied, or, rather, followed by constant cultivation, both with horse- and hand-hoe, until the haulm is too far advanced to allow the passage of the implements without damaging it.

According to the modern German theorists, nitrogen is of no service to this crop: according to the English practical farmers, it largely increases the yield of tubers, though, as one would naturally expect, heavy dressings of nitrate of soda, or of sulphate of ammonia, tend to increase the effects of the disease if it attacks the crop at all. For my part, I would always aim at ten tons an acre, and run the risk of the disease and its effects.

Potash, as I have often had occasion to observe, is comparatively useless unless it be applied to the land the previous autumn; in which case there is a great chance of its being washed away by the spring-thaws. For, potash takes a long time in the ground to become fit for plants to feed on, and as our spring-work rarely begins before the end of April, or the first week in May, it stands to reason the potash, if applied then, cannot be available soon enough to benefit the potatoes. Besides, if land is freely manured, and anything like a regular rotation of cropping is pursued, on all except the utterly worn

TABLE V.—GREEN MANURING EXPERIMENTS WITH OATS.—YIELD OF THE CROP.



No Nitrogen. 3.2 ozs	Manure: 1 oz. Nitrate of Soda. 13.1 ozs.	Green Manuring with Mustard 2.4 oz	Green Manuring with Vetches. 14.6 ozs.	Green Manuring with Lupins. 11.3 ozs	Green Manuring with Buckwheat. 1.8 ozs.	Green Manuring with Peas. 15.4 ozs.

out soils there will be found a sufficient quantity of potash to answer the demands of our crop. I firmly believe that potash is the last of the valuable constituents of our soils to be exhausted by cropping. A good dressing of farmyard dung contain about 250 lbs. of pure anhydrous potash!

Superphosphate of lime, whether made from bones or from our own *apatite*, is a valuable addition to the other fertilising materials I have mentioned. Speaking of the quantity to be used, I should rather like to be allowed to reckon it by the contents in phosphoric acid than by the cwt.; for, the strength varies too much to admit of our saying: I put so many cwts. of superphosphate to the acre. For potatoes, I should apply about 40 lbs. of phosphoric acid to the imperial acre, which would be equal to about 500 lbs. of the Capelton "plain superphosphate." This, added to 200 lbs. of nitrate of soda, and scattered over the dung after it is spread in the drills, would probably pay well for itself. If you aim at a very full crop, and can stand the outlay, I strongly recommend an additional 200 lbs. of nitrate of soda, to be sown *over* the crop just after the haulm is shaking hands across the rows.

The preparation of the land for potatoes—and this will hold good of the root-crop in general—should begin immediately after harvest. The field chosen should be one that has borne a grain crop—the last of the rotation,—and the stubble should be broken up as soon as possible, either with the plough, which is the worst, or the grubber, which is the best implement for the purpose. The plough is the worst, because it cuts the couch-grass, our worst enemy, into small lengths and buries it; the grubber is the best, because it drags the couch-grass out of the land and leaves it on the surface. Will no spirited man import one of *Coleman's drag-harrows* to serve as a model? It is by far the best grubber extant, except the *Ducie cultivator*, but the latter requires 4 heavy horses to work it.

After passing the grubber both ways, along and across the piece, harrow and harrow again, rake the weeds together, get them off the land, and plough it in good form for the winter. A furrow 8 x 11 inches will do on most soils. I need not insist on the necessity of careful water-furrowing.

When spring arrives, cross-ploughing, grubbing, and harrowing will get the land into a fit state for drilling up. For the ordinary kinds of potatoes planted in this province, such as the Early rose, Beauty of Hebron, &c., 24 inches between the drills will be ample space. (1) Then lay out the dung in heaps taking three drills at a time, for spreading is more easily done this way than if five drills are taken. Scatter, next, the artificials; then plant the sets a foot apart, at least two eyes to each, which will take about 16 bushels to the acre, and cover in at once.

Cultivation.—Just before the young shoots are making their appearance through the drill-tops, harrow along the drills, and repeat the operation until the implement is likely to injure the plants. Then, set the horse-hoe to work and keep it going Hand-hoeing along the row on each side, with a stroke between each two plants is not expensive: a good workman will easily get over an acre a day.

Earth-up before the haulm is too long: nothing looks worse than trampled haulm in a potato-field. The earthing should be very flat at top and not piled up high as we usually see here. Jensen's plan of high-earthing as a preventive of the disease does not seem to have made many converts.

The Aspinwall potato-planter does its work perfectly.

Many useful attachments to the tail of the double-mould-board plough assist greatly in getting up the crop.

Carry the haulm off the piece before beginning to plough out the tubers.

(1) *Champions* take much wider spaces. A. R. J. F.

Harrow the land after the potatoes are picked up into the carts, but don't leave the field in that state for the winter, as some wiseacre advised in a late number of one of the U. S. agricultural papers, plough it into good shape in October, and leave it well water-furrowed for the spring-crop.

Change the seed often: at least, every three years. For sets, I prefer moderate-sized whole potatoes, about the size of a large egg. Select these at harvest time, and let them green by exposure, taking care not to allow them to get touched by the frost.

Paris-green the last hatch of beetles as carefully as the first.

The Bouillie-bordelaise—lime and copper—does not seem to have answered so well as it was expected to do. Early planting is the great opponent of the disease.

Never plant potatoes in damp places. Such a sight as M. Daignault's field at Lachine in 1890 I never saw: the horses splashing up the water as they were ploughing out the tubers. And the man had been a farmer all his life! The yield was 40 bushels to the acre, of which nine-tenths were rotten!

Grain, sown down with grass-seeds, should follow the potato-crop, useless the land may be wanted for silo-corn or sugar-beets.

Remember, that if you sell your potatoes off the farm you are in honour bound to repay the land for the loan. Other fallow-crops are (or ought to be) consumed on the spot, but potatoes are, in nine cases out of ten, exported, and they are, in consequence, properly called an exhaustive crop.

If every set of potatoes planted yielded a pound of tubers, there would be, at the distance above recommended, between 300 and 400 bushels to the imperial acre! In strictness, 21,800 lbs., which is equal to about 390 English bushels. And yet our province hardly produces 100 bushels to the acre!

I am glad to see, by the bye, that my old friend, Mr. Wm Hale, of Sherbrooke, has won the prize for the best acre of potatoes grown in the Dominion of Canada. A letter from Mr. Hale to the *Weekly Star* on the subject is unfortunately crowded out this month, but it shall appear in the June number of the Journal.

Mangels.—The mangel-crop should be put in as soon as possible after the land gets dry enough to work kindly. No fear of its going to seed here. Orange-globe, though better in quality, does not produce the same amount of digestible nutrients to the acre as the long red. Cultivation the same as for the potato up to the time of sowing. Roll after the drills are split over the dung. Sow about 5 lbs. of seed to the acre, having previously soaked and sprouted it. A few turnip-seeds among the mangel-seed will show the rows in 6 or 7 days, and enable you to start the horse-hoe to work. Single to from 10 to 12 inches in the row, pulling down the drills as much as possible. After the second hoeing, give a dressing of 200 lbs. of nitrate of soda to the acre. Any one who sows mangels without nitrogen, in some form, in addition to a liberal dose of farmyard dung, commits a great error. All other expenses are the same, except a little more labour in harvesting, which, I suppose, nobody will object to. No superphosphate. Salt *is* good for this plant.

Carrots.—White Belgians are the best for field culture. I never saw any good from using artificials for this crop. Cultivation as for mangels, except that they should be singled at 5 or 6 inches apart. *Parsnips* require very thick seeding: 6 lbs. will not be too much to allow to the acre, and 4½ or 5 lbs. of carrot-seed. Singling same as carrots, or perhaps an inch farther apart. No good to try artificials for parsnips.

Swedes.—A fair coat of dung and 40 lbs of phosphoric acid = 500 lbs. of Capelton "plain superphosphate." Single to 10 inches apart. For some reason that is dark to me, M Séraphin Guèvremont, of Sorel, has always succeeded so much better with swedes than with mangels, that he has entirely given up sowing the latter. On heavier soil I fancy the reverse would be the case, particularly if the turnip-fly is prevalent. M. Guèvremont has never been troubled with that beast.

If the seeds of mangels, carrots, and parsnips are steeped and sprouted, they must be sown by hand in a furrow, about an inch deep, made by the hoe. In a late season, as most of our seasons are, this will pay for the trouble. I have had parsnip-seed six weeks in the ground before coming up, and I leave you guess what the weeds were like before hoeing. The crop cost three times as much to single and keep clean as did the carrots and mangels alongside of it—steeped and sprouted before sowing. I know the handy little seed-drills are very fascinating and economical in a busy time, but, depend upon it a few hours saved in sowing may cost you many hours work in singling (1)

Cost of singling roots.—The cost of singling roots varies, of course, with the rate of wages paid for day-labour in the district concerned, and with the skill of the farm-people who do the work, which skill depends upon the more or less quantity of such work each has to do in the season. In Scotland, where at least one-seventh of the whole farm is every year in roots, men and women are so accustomed to single and hoe swedes, &c., that they get over an almost incredible superficies of land in a few days. Here, in the province of Quebec, there are so few farmers who grow roots, particularly among the French Canadians, that it is rare to find a man who understands the use of the hoe. The following list of prices, by the acre, will give some idea of the variety of cost in different places :

South Wales	$2.00	for singling and	2nd hoeing;
Kent.....	1.80	do	do
Morton, Lanblethian (Scotland).....	1.44	do	do
East Lothian (do).....	90	do	—
Forfarshire (do).....	.65	do	—
Sorel, Que., (M. Guèvremont)	2.40	do	—
Waterville (M. Vernon).	1.75	do	—

SHORTHORN BULL, NEW YEARS GIFT.

SOLD AT THE SALE OF HER MAJESTY THE QUEEN FOR 1,000 GUINEAS TO THE EARL OF FEVERSHAM.

In the four last cases, I have no data to go upon as to the cost of the second hoeing, but I know a handy man, or even a woman, can hoe *along* the rows, as I mentioned above, at the rate of an acre a day.

Thus, even at our Sorel prices, $2.40 for singling and a dollar for second hoeing, the whole cost of manual labour only amounts to $3.40 an acre. So, a fair crop of roots, say, 800 bushels, would cost for hoeing less than half a cent a bushel !

(1) The *Planet Jr.* seed-drill did sow steeped carrot-seed well in the hands of Mr. Gylling at Sorel ! A. R. J. F.

Practical test of milk by the Babcock method.

DESCRIPTION AND MANIPULATION.

A lecture given at the Montmagny Meeting of the Dairymen's Association ; By M. H. Nagant.

Last year, we had the satisfaction of announcing to our readers (see the April No. of the Journal of Agriculture for

1891, p. 59) that at last a practical method had been discovered of making an exact and speedy test of milk. Up to that time, we had hardly any other alternative, to gain a true idea of the value of a sample of milk, than either to get an analysis of it made by a chemist working in his laboratory, a long and costly proceeding, or to make use of methods simple enough, but, generally speaking, very inexact.

But, you will say, how about the *lactometer*, what use do you make of that? Are not its indications recognised as satisfactory when it is used successively on full milk first, and then on the same milk skimmed? Let us answer at once, for the good reputation of the lactometer, that it is a good and trustworthy instrument, a happy invention and one that very nearly answers the expectations its inventor formed of it; that is to say that with a *good* lactometer it is easy to discover if the milk tested is pure or adulterated, an important result as regards the detection of fraud. On this account, this instrument will always enjoy a share of the public favour. But, are we always to rest satisfied with knowing if milk is pure or not? Would it not be as well for us to enquire if it is not time for the maker of butter or cheese, who wishes to conduct his business in a sensible manner, to examine carefully the composition of the raw material (the milk) which he is about to go to work upon for the purpose of extracting from it butter or cheese? In all other industries, the workman knows perfectly well how far he can depend upon the different materials he receives, before he pays for them, works them up, and sends their products to market. It is in a great measure on this knowledge that he bases his manufacture and his calculations to impress a certain, fixed direction to the conduct of his affairs. Why, up to the present time, has the maker of butter and cheese been an exception to this general rule? Because there had not yet been invented an easy and thoroughly practical method of analysing milk, more especially as concerned the fatty matters it contained. Now, the new Babcock method enables us to fill up this void, and it is unnecessary to expatiate at length on its advantages and good qualities, seeing that it is regularly employed in almost all the large dairies in the Northern States, and the chemists, who have submitted it to comparative tests with the most rigorous scientific methods, admit that it possesses such a degree of exactitude as renders it absolutely sufficient for practical use.

Before describing this new method, let us in a few words recall to our memories the composition of milk:

In the first place, here is a definition of it given by professor Babcock, in which I shall presume to make a slight modification:

Milk is an *emulsion* (1) of fatty matter (butter) in a watery solution, more or less complete, of albuminoid matters (casein or cheesy matter and albumen) of sugar of milk, and of mineral salts.

Average composition of milk:

100 lbs. of milk contain, on an average, 87½ lbs. of water and 12½ lbs. of solid matters as exhibited below:

Water	87½ lbs.
Fatty matters (butter)	3½ "
Casein (cheesy matter)	3½ "
Albumen	0½ "
Sugar of milk and mineral salts	5 "
	100 lbs.

(1) An emulsion is a liquid holding in suspension an insoluble fatty matter which is in the state of very tiny globules, which impart to the liquid an appearance of cloudiness more or less translucid and opalescent. Any one can make an emulsion by vigorously shaking a flask containing some water to which is added a little linseed oil.

While the percentage of butter may vary in different qualities of milk from 2½ lbs. to 7 lbs, the casein and all the other solid matters only vary from 8½ lbs. to 10 lbs.

Of all the elements of milk, butter is the most valuable: in fact, it is this element that gives its value to the milk and which, therefore, ought to be the basis of every valuation of milk. Besides, every one knows that skim-milk has only a very slight relative value, although it is worth good deal more than many farmers think.

The average density of milk, at 60° F., varies from 1029 to 1033; this means, that if a certain measure of distilled water weighs 1000 lbs., the same measure of milk at 60° F. will weigh 1029 to 1033. As every one knows, the use of the lactometer is based on the difference of density between water and pure milk. The lactometer usually employed in the province of Quebec has not the figures quoted above on its stem. To ascertain the true density or specific gravity of milk, a milk-weigher (pèse-lait) called a *lacto-densimeter* has been constructed, having on its stem a scale graduated from 15 to 40, and thus able to show densities varying from 1015 to 1040. This *pèse-lait*, called Quèvenne's lactodensimeter, is still very little known in the province, and we should not have mentioned it had it not become a very useful aid to the Babcock centrifugal tester, inasmuch as, by its indications, it allows the results of the Babcock to be completed.

The Babcock method.—This method, which has for its proximate aim the discovery of the percentage of fatty matter contained in the milk, is founded on the action of sulphuric acid (oil of vitriol) on the milk:

Suppose that you were to pour into a glass bottle a certain quantity of milk, and then to add little by little some sulphuric acid, mixing the two liquids thoroughly; the effect would be that the first portions of the acid would curdle the milk, just as rennet does; the butter of the milk remains enclosed in the curd and cannot free itself. But, if you continue to add acid, you will see the curd redissolve itself by degrees; at the same time the liquid will assume a chocolate-brown hue and become excessively hot. When you have poured in as much acid as there was originally of milk, all the curd will have been so thoroughly dissolved that it can no longer retain the butter, so this will rise and spread itself over the surface of the liquid in the form of a thin layer of oil: this is the *reaction*; but up to this time the separation of the butter is not complete, for there still remains some of it throughout the depth of the liquid. In order to compel the whole of the butter to rise to the surface, all we have to do is to fix the bottle containing the milk and acid in a turbine, or centrifugal machine, taking care to lean the neck of the bottle toward the centre of rotation, and to make the turbine revolve at the rate of 700 revolutions a minute; the centrifugal force will then act as in the centrifugal separator; it will compel the butter, which is the lightest, to betake itself wholly to the point nearest to the axis of rotation, and the separation of the butter from the rest of the liquid will be complete: such is the Babcock machine.

Of this machine there are several types, contrived by the different makers, but they all work on the same principle: a wheel capable of making 700 to 800 revolutions a minute (see engraving, p. 76) carries on its circumference a certain number of cylindrical pouches slightly inclined and leaning in the direction of the spokes. These pouches, varying in number from 4 to 60, according to the size of the machine, are intended to receive the *graduated bottles* (fig. 1). The wheel is set in motion by the hand by means of a crank and gear-work or belting.

The glass bottles (fig. 1) have long necks, bearing a scale graduated from 0, 1, 2, &c., up to 8, 9, or 10; the figures 1,

2, 3, &c., signifying 1, 2, 3, %, and the intermediate divisions representing the 0.20 %.

Measuring the sample.—To measure a sample of milk, we must first be sure that the milk is thoroughly homogeneous, and to ensure this, it should be poured several times from one vessel into another, to incorporate the cream completely with the milk. Now, plunge into the milk the point of the pipette (fig. 2), which is a glass tube with an enlargement in the middle, and with a mark towards the top showing how high it has to be filled; this pipette will hold 17 6 cubic centimetres of milk (1).

While you are plunging the lower part of the pipette into the milk suck with the mouth at its upper end so as to draw

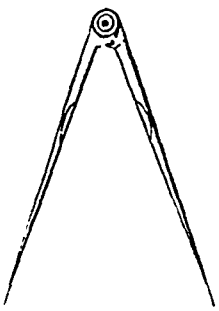


Fig. 4.

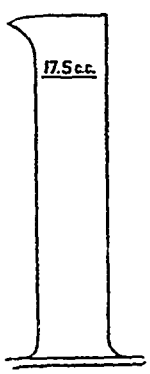


Fig. 3.

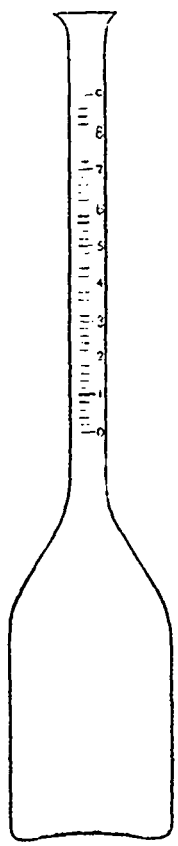


Fig. 1.

Fig. 2.

up the milk above the mark; place a finger of the left hand under the lower end of the pipette, draw it out of the milk, with the fore-finger close the upper end, and, keeping that end more or less shut with the fore-finger, allow the level of the milk to descend to the mark: you can thus be sure to have the exact volume of milk desired. Now, take one of the graduated bottles in the left hand, holding it gently sloping, introduce the point of the pipette into the neck of the bottle leaning it against the interior side of the neck, and withdraw the fore-finger of the right hand from the upper opening of the pipette: the milk will then flow into the flask. This being done, wait a few seconds to allow the last drops of milk to gather together towards the bottom of the pipette, blow into it a little, to drive the last drops into the flask, and the sample of milk is ready. The same process is gone through with the different lots of milk to be tested, and, when all the bottles have received their samples, the re-agent, which, as we have said, is sulphuric acid, is to be added.

The use of sulphuric acid.—The acid employed is the ordinary commercial sulphuric acid density or specific gravity of about 1.82 (which can be verified by the aræometer or acid-weigher, made on the same principle as the milk-weigher. Were the acid too weak, it would not dissolve the casein, and the butter could not disengage itself; if the acid were too strong, carbonaceous matter would be formed, and the butter itself would be attacked. Generally speaking, the acid met with in commerce possesses the requisite strength.

To use it, fill a glass measure, represented in fig. 3, up to the mark: this holds 17.6 cubic centimetres. The acid need not be measured with such nicety as the milk sample; according to our own researches, a little more or less acid does not exert much influence on the results. With the left hand, you will take one of the graduated bottles already charged with milk, then, holding it a little sloping, take with the right hand the glass filled with acid, and, leaning its spout on the mouth of the bottle, pour carefully into it all the acid in the bottle: and the same with the other samples. This having been done, take the bottles one after the other by the bottom of the neck and mix the acid and milk well together by shaking them round and round (horizontally), but taking care not to shake them up and down (perpendicularly), until the mixture, which will get very hot, assumes a chocolate-brown hue and the whole of the curd is dissolved. Not one single grain of the curd must be visible in any part of the flask. Care must be taken not to shake the bottles until the sulphuric acid has been poured into every one of them, in order to profit by the heat developed in them: the bottles should then be placed as soon as possible in the centrifugal machine.

The Babcock centrifugal tester.—The machine (see cut p. 76) can be put in motion either by hand-power or by a belt attached to a steam-engine, as is sometimes the case in large dairies. The principal part is a disc or wheel able to revolve horizontally at a great rate (700 or 800 revolutions a minute), along the spokes (*radii*) of this wheel are soldered cylindrical sheaths or pouches intended to receive and retain in their places graduated bottles, whose number varies according to the size of the apparatus from 4 bottles in the smallest to 60 in the largest size; those most frequently employed are made to hold from 10 to 20 bottles. The wheel in which the bottles are placed receives its motion through a belt or gear-work moved by a hand-crank. In the Babcock machine bought by the Department of Agriculture and Colonisation, made by Messrs. Fargo & Co, Lake Mills, Wisconsin, the requisite speed is obtained by turning the crank 75 times a minute. The turbine-wheel does not work in the open air; it is enclosed in a round tin bason, or preferably one made of copper, which is fix to the frame of the machine. This bason, which is provided with a large moveable cover (and also with a small tap at a point in its circumference near the bottom), serves for two purposes: 1. hot water may be poured into it to keep up the temperature at a degree which will ensure the success of the test of the milk; if the water is too cool, it can be warmed up by placing a lamp under the bot-

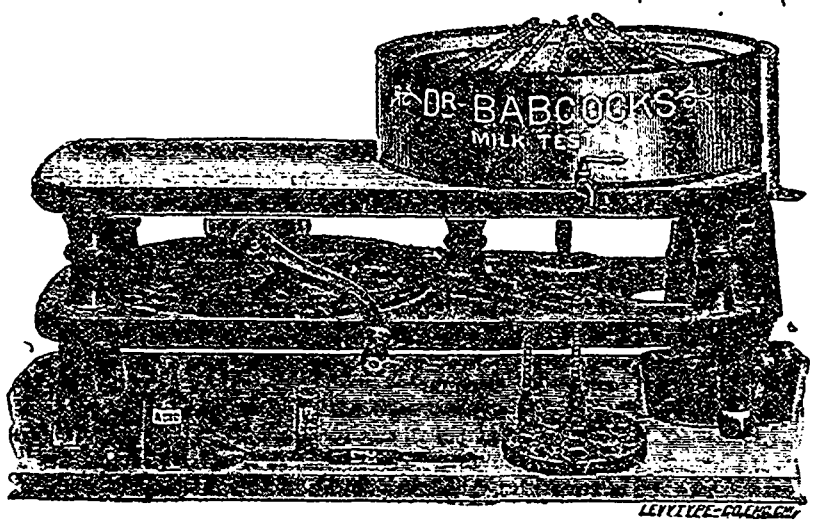
(1) The quantity of milk that flows into the flask is, in reality, only 17 5 cubic centimetres: but the pipette holds 0.1 of a cubic centimetre more, for it has been found that 0. 1 c. c. of milk adheres to the interior surface of the pipette $\frac{1}{176}$.

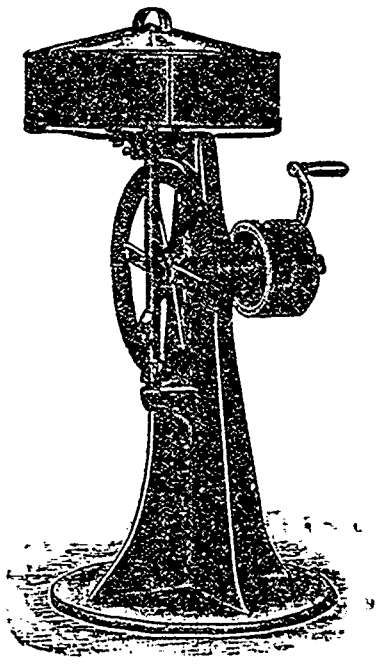
A cubic centimetre is about the $\frac{1}{1000}$ of the old Canadian quart.

tom of the bason ; 2. to protect the operator from any accident that may occur, for instance, if one of the bottles full of burning acid were to break . it must not be forgotten that burns caused by sulphuric acid are very serious. (1)

As the Babcock is not patented, many makers have varied the arrangement of its parts more or less advantageously. Thus, in one or two models, such as those made by D. H. Roe & Co, the cylindrical pouches that hold the bottles, instead of being fixed on the turbine-wheel, are soldered on movable stems united by joints (*articulations*), or, more simply, by a hook, to the central disc of the turbine, in such a manner that when the machine is at rest the bottles occupy a vertical position (and may dip into the hot water in the bason), but as soon as the machine is going at full speed, the bottles rise into a position almost horizontal. This arrangement is, in our opinion, an improvement, but it is not indispensable. Whichever system is adopted, the test of the milk is proceeded with as follows :

First operation (*turbinage*).—As we saw just now, the graduated bottles containing the mixture of milk and acid were placed in the pouches of the turbine. The bottles bear a ticket on a copper ring, the numbers on which correspond with the different milks under test. If more than 10 or 12 tests are carried on at once, it is absolutely necessary that hot water be put into the bason at the beginning of the operation , in every case, the temperature of the bottles and of their contents, from the beginning of the operations up to the end of the reading off of the results, must not be allowed to fall below 100° F., and it is advisable that the water in the bason be at a temperature of 200° F., before the bottles be placed in the machine.





The bottles being carefully placed in the very bottom of the cylindrical pouches, the cover is put on the bason and the machine set in motion so that it may quickly attain a speed of about 700 revolutions a minute, which speed should be kept up for about 6 or 7 minutes. The effect of this rotation is to completely separate the butter from the rest of the liquid, so that, after the stoppage of the machine, the butter is found floating by itself on the top in the form of an oily layer more or less thick. The machine having been stopped, the cover is lifted off, and the bottles are filled up with hot water ; an operation that may be done at once, *but better at two different times, with a fresh rotation of the turbine between them.* The bottles, then, are taken out one by one, and hot water is poured into them *very carefully* until the layer of butter, which rises by degrees into the neck of the bottle, arrives within the limits of the graduated scale. I say *very carefully*, because the butter must not be allowed to rise too high, that is, above the graduation, since that would vitiate the experiment. Generally, it is so managed that the upper level of the butter reaches nearly the figure 7 or 8 of the scale. The hot water used can be withdrawn from the bason by the tap, or any hot water can be employed by the use of the pipette or the graduated glass, &c. After having thus filled all the bottles and replaced them in the turbine at once, the cover is put on again and a second *turbinage* given.

Second turbinage.—This is meant to completely gather the fatty matter into the graduated neck of the bottle and thus to enable us to estimate its quantity exactly. This second *turbinage* (which, when two separate additions of hot water to the bottles are made, is followed by a third) only lasts one minute ; and then the reading off of the results follows in haste.

Reading off the results.—We have now succeeded in isolating the fatty matter of the milk and have brought the whole of it into the contracted neck of the graduated bottle, where it appears in the form of a little cylinder of oil, in colour a yellow more or less pale ; its lower extremity is almost level (*plane*) or flat, and, if the test has been well conducted, it forms a very distinct line of demarcation from the liquid below it. The upper extremity, owing to the effect of capillary attraction exercised by the glass-tube, instead of being flat, presents a hollowed surface of this form ◡, and may be the occasion of erroneous calculations, unless care be taken to observe that the upper extremity is determined, not by the lowest point of the hollowed surface, but by the *sides*, which are higher, for the graduation of the scale has been constructed in accordance with that intention.

We must also remember that the figures 1, 2, 3, 4, &c., on the scale of the bottle represent 1, 2, 3, 4, &c., per cent., and that the intervening lines represent 0.20 per cent. So that, to read off the percentage of the fatty matter it will be sufficient

(1) Wherefore, when I make superphosphate, I always empty the carboys of acid by means of a siphon, so that there may be no splashes. A. R. J. F.

to note in what points of the scale the upper and lower extremities of the layer of butter are situated, and to subtract the lesser number from the greater. For instance, if in the sample of milk we have just been testing, we find at the upper extremity the number 8.30, and at the lower, 4.10, by subtracting 4.10 from 8.30, you find 4 20 °/₀ of fatty matter.

Instead of proceeding in this way, a method may be employed which seems to us to be easier and more speedy. We measure the depth of the layer of butter with a pair of compasses (fig 4), apply the lower limb to the 0 on the graduated scale, and read off the number indicated by the upper limb : this number is the true percentage sought.

A word of explanaton on the result obtained.—Now, then, we have got at a most important result : the knowledge of the exact quantity of fatty matter contained in the sample of milk. How much butter would a maker get out of it ? Would it be the exact quantity of the fatty matter indicated by the Babcock ? Some *crazy* people will reply (as we have been told lately) that if the Babcock test be exact, the same quantity of butter should be made from 100 lbs. of milk as the percentage of fatty matter indicated by the Babcock test. But we know perfectly well that butter, as made up, is not *pure* fatty matter, since it contains, on an average, only 85 °/₀ of the latter, and that the remaining 15 °/₀ consists of water, salt, &c. On the other hand, we know that the processes of skimming, churning, &c., in spite of the great degree of perfection to which they have arrived, do not utilise the whole of the fatty matter of the milk : there is always some considerable loss. It may be said, too, that on the greater or less skilfulness of the maker depends the yield of butter from a given quantity of milk. However that may be, we may admit that 3 60 °/₀ of fatty matter should correspond with 4 °/₀ of made up butter.

H. NAGANT.

(*From the French.*)

Meeting of the Dairymen's Association at Montmagny.

On the 27th January, 1892, the Dairymen's Association of the Province of Quebec held its annual meeting at Montmagny I propose to give a very concise account of the principal subjects discussed, and I must apologise to the association for my apparent neglect in not having done so before, but the fact is I could not get any trustworthy report till the French edition of the *Journal of Agriculture* for March appeared

M. Caron, a young colonist, architect, and farmer, of St. Adrien, Megantic, delivered the first lecture : On the dairy industry as connected with colonisation. The cry, "Farming does not pay," is devoid of truth.

M. l'abbé Montminy praised the farming of M. Caron very highly. He had visited his place and felt more and more convinced that, "provided a man has pluck and perseverance, loves his country, and is not ashamed of his business, farming is a profitable occupation."

The diplomas to the inspectors of creameries and cheese factories were then distributed.

A letter from M. Dupuis, commissioner to the Jamaica Exhibition, was read, in which he mentions that "Condensed milk from Nova Scotia was well known in the island, as were Canadian butter and cheese, though, in these articles, the American had the pull over us. M. Taché, the secretary, exhibited 7 sizes of tin-boxes for export-butter.

M. l'abbé Beaudry lectured on the dairy industry in Manitoba. The progress there made was something wonderful considering the short time it had been at work.

Mr. Barnard, secretary of the Council of Agriculture, and director of the Journals of Agriculture, drew the attention of the convention to the necessity of attention being paid to the dairy products of our own province. From what M. Beaudry had said, it was evident a great deal of competition was imminent from the butter-makers of Manitoba.

A proposal was made by M. Bourbeau, seconded by M. Montminy and Mr. S. A Fisher, that a "Grand syndicate of farmers be formed, the central point of which shall be at Quebec."

Mr. Ed. A. Barnard gave a *résumé* of his visit to the Burlington butter-school.

M Taché read a letter from M. A. Dupuis, of St. Roch des Aulnaies, in which that gentleman requested information on divers subjects connected with the products of the dairy. Mr. Barnard invoked all the rigours of the law against every milk-thief.

Speaking of the Nova Scotia condensed milk, the president said that at the Jamaica exhibition it was found to be fully equal to that imported from Switzerland. It would be wise of us, in this province, to embark in the confection of condensed milk.

M. Chapais, assistant commissioner of the Dairy-industry for the Dominion read his "Travelling Notes" ; he visited 48 different localities. His lectures were on the following points : 1. dairying preserves the fertility of the soil, or restores what it has lost ; the duty of the dairy farmer is to make his cows yield as much milk as possible at the lowest cost ; and the way to make them do this is to select good cows, feed them well, and keep them in health. 2 On the best means of getting the greatest profit out of the milk ; first, by producing sound, clean, strained aerated, cooled milk ; secondly, by patronising syndicates ; thirdly, by making butter in winter as well as in summer : winter butter is well suited to exportation.

The second object of M. Chapais' visits, in company with the dairy-inspectors, was to give instruction to the makers. Grave faults were found in the factories : want of cleanliness ; defects in the buildings ; inferior milk brought by the patrons and accepted by the makers. The last defect the Babcock will remedy. Self-conceit and carelessness in their work are the principal faults the makers have to correct.

Uniformity of quality is much needed.

A *refrigerating aerator* of very simple construction was exhibited. A lecture was read (in French) on the work of Mr P. Macfarlane, inspector of the Bedford syndicate on the manufacture of cheese. In his opinion, the institution of syndicate inspection has already increased the value of dairy-products in the province by a quarter of a million of dollars.

Questions were asked about the desirable qualities of the curd, and how to get rid of the "eyes" in cheese, which Mr. MacPherson said were due to want of cleanliness in, or the non-aeration of, the milk.

Mr. Barnard announced that the Hon. M. Beaubien, minister of agriculture, was prevented from being present, but that he was desirous of advancing the interests of agriculture in general, and of the dairy industry in particular.

Mr. MacDonald's report, as inspector, was then read (in French) by M Taché, showing the defects in the cheese-factories, there had been some improvement, but the fittings might be ameliorated by copying those of Ontario. Those districts in the province of Quebec that have no inspectors are decidedly behindhand the rest.

On the second day, M. Nagant read his practical essay on the Babcock tester, a translation of which will be found on p. 73 of this number of the Journal. May I be forgiven if, for once, I desert my practice of never praising my confrères' work, and say that it is so clear and full that a child could understand the working of the implement ?

M. Aimé Lord, of the College of l'Assomption, followed on

the same subject, declaring that hereafter there will be no difficulty in paying for the milk of the patrons in proportion to the percentage of butter it contains.

Then came Mr. MacPherson, whose lecture, translated into French, was read by Mr. Barnard. Winter production of milk was the subject: can cows be profitably milked in winter, and during how many months? What is the most suitable food for them? What breed of cows is the best for this purpose? &c., &c.

Mr. Barnard then addressed the convention, describing his entrance into the farming fraternity. He also advised the making of dairy-products in winter. The cows at the Convent of the Sacred-Heart, at Quebec, give an average of 16 lbs. of milk a day throughout the year. Ensilage is the food for milk . a ton of ensiled clover is worth two tons of maize silage. Mr. MacPherson says the Canadian cow is the best of all.

In a discussion that followed, M. l'abbé Beaudry thought that the *melilot*, (a great, coarse-stemmed, showy plant of the *trifolium* family) was good for cows. Mr. Barnard, on the contrary, thought it only good for bees. (Mr. Barnard is quite right too. A. R. J. F.).

As to the samples of silage exhibited, Mr. Fisher said that almost all of them had a disagreeable smell, like that of manure, and he fancied they were on the eve of becoming rotten. They must have been ensiled in too damp a state; but, on the whole, they were very fine. Wild grasses made into hay are good for nothing, but when fermented in the silo (of which there were several samples), they become good fodder.

After a discussion on this matter of the silo, M. Bernatches related his experience in Europe when investigating the subject of the manufacture of beet-sugar. It is a benefit to any country, since the cultivation of the beet improves the land vastly. Here, the first attempts broke down for divers reasons, but, in spite of the dearness of labour, the other conditions are in its favour. If our roads are bad in autumn, they are excellent in winter, and if the beets do get frozen, they are not injured, provided they do not thaw out again.

At the evening meeting, the newly elected president, M. l'abbé Montminy, took the chair.

M. Saül Côté read his report as inspector, which showed that *no less than* 219 *cases of fraud* had been detected, many of which had been brought before the magistrates and caused severe punishment to be inflicted on their authors. Among divers prominent faults committed by too great a number of patrons, he named: filthiness, want of aeration of the milk, unhandy fittings up of buildings, carelessness and sloth! Frequently, he found defective thermometers.

In the province, there are now 660 cheeseries and 140 creameries. In the latter, 9 million lbs. of milk were used, from which were made 40,000 lbs. of butter, worth, at 20½ cents a pound, $84,000.

In the cheeseries, 135 million lbs. of milk yielded about 13 million lbs. of cheese, which, on the average, sold for 9 cents a lb. = $1,200,000.

The discussion that followed M. Côté's address brought out clearly the great benefit that both patrons and makers had derived from the establishment of syndicates.

M. J. de L. Taché, at the request of M. J. L. O. Vidal, exhibited to the audience a newly invented instrument for testing milk called "The little Detective."

Towards the close of the convention, many questions of great interest were discussed, particularly one relating to the use to be made of *frozen milk*. Can good butter or cheese be made out of it? M. J. de L. Taché stated that it might be utilized for these purposes, provided the usual system of treating it were modified to a certain extent.

After the usual thanks to the inhabitants of Montmagny, &c., were rendered by Mr. Sidney Fisher, the convention was declared dissolved.

H. NAGANT.

(*Condensed from the French.*)

The Huntingdon Dairymen's Association.

This society held its annual meeting at Ormstown, on the 15th March. The President, Mr. Robert Ness, in the chair, in his address, Mr. Ness, after mentioning the abundant harvest of the autumn, said that prices were remunerative, except for barley. The cheese of the province was in great request in England, Messrs. Sharples and Jones, a large importing firm at Liverpool, pronouncing it to be equal if not superior to that made in Ontario.

Mr. MacPherson mentioned that 1862 much cheese was imported into Canada, but now Canada exports more than 8 millions dollars' worth a year.

Mr. Ed. A. Barnard, secretary of the Council of Agriculture, spoke of the benefits the Messrs. Stephens, of St. Lambert, had conferred upon the country by the importation of their Jersey cattle. Mr. Barnard advocated winter-dairying. Cows must have succulent food—ensilage to wit—out proper food alone, without warm water and warm lodgings, will not do. Clover made excellent silage. Maize for silage should not be cut till the ears are glazed.

Mr. Sidney Fisher, of Knowlton, spoke very highly of the improvement visible in the farming of the French-Canadians. They are anxious to get good stock; in neatness and cleanliness they excel the English-speaking people, and if the latter do not look out, the French Canadians will leave them behind before 5 years are over.

He saw in the Huntingdon district, last June, wonderful crops of pease; but he disapproved entirely of the practice of drawing out manure and spreading it on the pastures. The June sun must bleach such manure and drive all the strength out of it.

Much talk on pease ensued; Mr. Thos. Drysdale had tried *superphosphate* for them and for clover and grass, but derived no benefit from the application.

Mr. James McKell, had over 30 *bushels an arpent* of pease on heavy land. (1)

Three inches Mr. Ness thought to be too deep for drilling pease; two inches were enough.

Mr. George Nussey. sowed 25 arpents of pease, 1 bushel, 3 pecks to the arpent, and had never failed for 32 years, except once. He sowed broadcast, and gave a stroke of the harrows first "to prevent the pease from rolling off the ridge."

Mr. Jas. McKell, on the other hand, had better pease when sown deep.

At the suggestion of Mr. G. W. Stephens, supported by Mr. Greig, M. L. A., and Mr. Ed. A. Barnard, it was determined to have a "French director for each county."

In the evening Mr. G. W. Stephens gave an account of the establishment of the celebrated herd of Jerseys at St-Lambert. The curé of St Alexis, where the speaker had some land, told him that he had been offered $2,100 for a bull he gave him for nothing.

Mr. W. H. Walker, the secretary gave an account of his visit to the St. Alban's creamery.

(I do not say much on this point, but refer my readers

(1) As the bushel of pease is 70 lbs. and the arpent is less than an acre by nearly one-fifth, it follows that, taking the English bushel at 64 lbs., which is about what a *struck* bushel of pease weighs, this crop equalled 36 bushels an acre, a very large yield indeed. A. R. J. F.

to Mr. Barnard's full description of the school &c., in the March number A. R. J. F.). As to cows for butter, Mr. Smith's large herd consists of Durhams and Alderneys (*Jerseys and shorthorns* ?), and, as to richness of milk there is not much difference between them. Mr Claflin said it depended more on the feed than on the breed, and told how, when the Alderneys got ahead, the Durhams were brought up by increasing their ration of meal. The Ayrshires, with their large flow of milk, are behind in richness of milk for butter-making.

Mr. Wm. Greig, M. L. A., said that pease were, and would continue to be, the principal crop in the Châteauguay district. At Ste. Martine, there are fields that have grown pease every year for 15 or 16 years without manure, and still grow good crops. The farms in question were once covered with couch-grass, but pea-growing had cleaned them.

(This is the very reverse of the effect the pea-crop has in my experience. A. R. J. F.)

Mr. Greig disagreed with Mr. Fisher on the hauling out manure in June on to the pasture. He thought top-dressing the most profitable way of applying manure.

M. D. M. MacPherson favoured making cheese in summer and butter in winter. Our farmers salt their butter too much for the English taste.

The general opinion of the meeting seemed to be that, while good butter was to be found here and there, it was pretty rare. Mr. Simpson, of the Valleyfield cotton-mills, said there was no good butter at that place. As dealing largely with the Southern States, he could and would assist the farmers who wanted cottonseed-meal at the lowest price by the car-load.

Mr. MacPherson valued cottonseed-meal at $45.00 a ton, the real cost being $26.00 !

Mr. S. A. Fisher spoke of paying for milk at the factories according to its richness. Our milk is richer than that of Ontario, and the Canadian cow gives the best foundation for butter-making cows. " Costing less, butter can be made from them at 12 cents, while butter from high-grade Shorthorns, at 26 cents is an expensive process." (Surely there must be some error in the report in the *Gleaner* of this passage!. Farmers paid for experimental farms and agricultural colleges, but how few farmers' sons go to them, and how few farmers, though within three hours of Ottawa, ever visit the experimental farm there ! " Manure is largely wasted ; there are no tanks to receive the urine, and as to spreading the manure on the fields in June, this in despite of what Mr. Greig said, is a wasteful process." A great deal of the *roughage* about a farm, waste stalks, rank grass, and the like could be utilised if accompanied by some concentrated food. Pease-meal, cottonseed-meal, and oilcake are far better than corn-meal. Cattle should be kept, in winter, at about 70° F. (?) and ought to be watered in the barn. Young men ought to stay on the farm, instead of going to the city to become clerks or professionals. The farm gave the greatest scope for intellectual capacity. Every farmer should cut his straw and hay with a chaff-cutter, and have a silo. As sweet butter could be made with silage in winter, and as cheaply, as with grass in summer : he had fully tested it.

Mr. Fisher, in reply to a steady stream of questions, said he kept 22 cows, which began to calve in September. He had made from them last week 136 lbs. of butter. He gave them oilcake, but never linseed-meal, which was too rich for cows. (I never found it so, when used with pease. A. R. J. F.) He used a good deal of cottonseed-meal and pease-meal. Sowed White Southern corn for ensilage, which grows about 17 or 18 tons to the acre.

As to wooden silos rotting fast, that, Mr. MacPherson said was due to the dampness retained in the double wall. He ventilated by boring 3 inch auger-holes at top and bottom, which were closed with wooden plugs when the silo was to be filled.

Mr. Fisher advised boarding round and round, instead of up and down, to avoid swelling from damp.

Mr. Ed. A. Barnard cut all his hay, and, after watering it, let it lie for 24 hours. The cattle relished it much better. His idea of a silo was to use 8 or 9 inch studs, and fill the hollow with dry earth. Silos so built had stood sound for 9 years. Had used silage up to the 1st July, and found it perfectly sweet. When the silo was empty, he let the air pass through it freely. It was folly to spread manure on snow : the leaching in thaws must carry off its goodness.

(Wherein I am in accord with the speaker, but top-dressing grass-land in summer is quite a different thing. A. R. J. F.)

—For Mr. MacPherson's address see below.

The convention was then declared to be closed.

D. M. MacPherson announced the subject of his address to be the business phase of farming, or how to make farming pay. After a number of general remarks, he came to the point, that the secret of making the farm pay was to have a silo and feed steers, which he illustrated from his own experience. Four years ago, he started with a farm of 130 acres of arable land, much run down. He rebuilt the buildings and added a silo. He put in 25 or 30 animals and grew 10 acres of corn to make into ensilage. Year by year the proportion grew, until last year he had 40 acres of corn and 180 animals. He bought 1000 lbs. steers in the fall at from 2¾ to 3¼ cents per pound, the average price of each being $30. During the winter he fed each beast ensilage and a ration of cottonseed-meal at a cost of $20, and he allowed $6 for labor, insurance, and use of stable, making a total of $56. In 6 months, each beast gained from 300 to 350 lbs. when he sold them for shipment to England at 5 cents a pound, or, on an average, $65 a head. He had a clear cash profit of $9 on each, and $10 worth of manure. When he began, there was not an acre that would grow wheat. Now he raised fine wheat and the land was paying handsomely. An acre of corn made into ensilage will maintain 4 steers. To the ensilage he added cotton seed meal, of which too much cannot be said in praise.

L. Simpson : What variety of corn do you plant and how ?

Mr. MacPherson answered that he had tried several varieties and found the Southern horse-tooth best for putting in the silo. The land must be well drained and the drills 3 feet 4 inches or 3 feet 6 inches apart, and a seed dropped every 10 inches. When thus planted thinly cobs will form. Besides large corn for ensilage, each farmer should have a patch of the sweet garden corn to feed green when the pastures fail. Had tried phosphates, but much preferred barn-manure.

W. Fennell : Objection is made by city buyers to milk from ensilage not keeping.

Mr. MacPherson thought the trouble arose from feeding sour ensilage, which was not fit for milch cows. Where the ensilage is sweet the milk will keep as long as any other. His rotation was 2 years in corn, 1 in grain, and 1 in clover, which he pastured. An acre of clover will keep two cows. He made no hay ; ensilage taking its place. When he could not get the quality of cows he wanted he made up in number. He was satisfied he could raise a heifer until she had her first calf for $15. He did not think farmers kept a quarter enough cattle. He had pastured 70 head on 55 acres of clover, cows averaging 5000 lbs. of milk. Manured at the rate of 20 tons to the acre. His average yield was 40 tons of ensilage-corn to the acre, 60 bushels of oats, and 2½ tons of clover.

Tame-grasses.—The *Dairy-World* says that it is safe to say that one-half of the creameries in Kansas are standing

idle. What has been the cause of so many failure? Is it on account of the soil or climate? There is a general impression that the lack of tame grasses is the principal cause. (*Watchman*) Permanent grass must be difficult to grow alongside of cotton. Still, there must be native grasses capable of improvement even in such a climate as that of Kansas. Would not irrigated lucerne do?

The value of cottonseed-meal.—The English estimate the value of the manure resulting from feeding one ton of this meal at more than the market-value (in this country) of the meal. (*Watchman.*) And Mr. MacPherson values the meal itself—for food and manure—at $19 a ton more than its cost price, i. e. at $45.00 a ton of 2,000 lbs., but though the theoretical value as given by Sir John Lawes, is $27.67, no practical valuer of tillages in calculating the manurial value of cake in the case of an outgoing tenant in England, would put it at anything like that sum.

Discrepancy among experts.—Curiously enough, at the meeting of the Ensilage Associations last month in Montreal, Professor Robertson, of the agricultural department at Ottawa, advised farmers to grow the grain for their cows on their own farms, while Mr. MacPherson, advised them to buy it. I agree with the latter, as the consumption of cake, &c., imported from abroad must conduce to the augmentation of the fertility of the land.

Waste of nitrogen in dung.—As the nitrogen in *recent* dung is in the form of albuminoids, I cannot see how the application of such dung to grass-lands, as a top-dressing, can be likely to deprive it of its most valuable constituent. The phosphoric acid, being in an insoluble state, is safe enough, and the potash too. I do not mean to say that I should choose June for top dressing grass-land, for there are many reasons against it; but even in summer, the dews, the showers, and the action of the earth-worms would soon inter all the valuable parts of the manure. How about top-dressing the beet-crop or oats or other grain with nitrate of soda? As for old manure, the loss after spreading cannot be great, as the ammonia is, so to speak, *fixed*. All our great grass-farmers in England have to top-dress, or else the land could never be manured at all, as it is never ploughed. I would never top-dress heavy arable land, as the mere mechanical effect of a heavy coat of dung on such soils is invaluable. In the four-course shift, or rotation, on sheep land, the custom is to grow the root-crop with superphosphate, and apply the dung to the young clovers. "Fermentation of the dung of animals with litter, probably results in the formation of nitrogenous humus compounds, which are insoluble and decompose but slowly in the soil." v. Warington: On the Chemistry of the Farm.

Plaster as a fixer of ammonia.—Dr. Girdwood, the celebrated professor of chemistry at McGill, in reply to a question I put to him a few days ago, said. I cannot conceive that ground plaster sprinkled over dry manure in the stable can have any effect at all as a fixer of ammonia. This is precisely what Philip Pusey the well known English agriculturist told me some 40 years ago.

Riding vs. driving.—Talking of horses, one of the Montreal evening papers had a trenchant sentence the other day. "Farmers' sons had better ride their horses than sit lazily behind them in baggies and sulkies." Just so. as a cow that is not trained to milk copiously soon gets weary of producing what nobody wants (the pedigree-shorthorns, Herefords, and others who suckle their calves); so, mares and stallions that are always used for harness purposes, become conformed to the style of build best suited to those purposes. Three generations of driving would spoil the form of the best family of hacks in England.

Phosphoric-acid.—*Basic slag*, in a very finely pulverised condition can be bought to-day in Liverpool, on the rails, at the works—bags free—for $8.00 a ton of 2,000 lbs. This makes phosphoric acid only 2⅔ of a cent a pound!

Lots of matter crowded out. A. R. J. F.

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