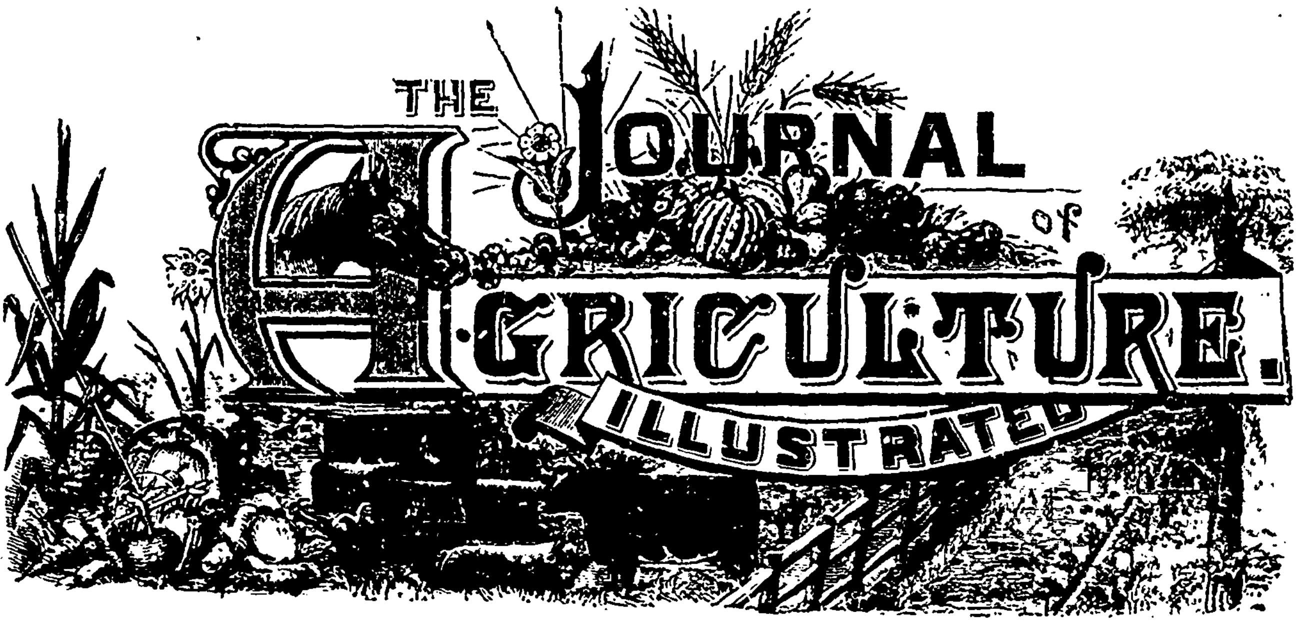

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NOTICE.—The subscription to the *Illustrated Journal of Agriculture*, for members of Agricultural and Horticultural Societies, as well as of Farmers Clubs, in the province of Quebec, is 30c annually, provided such subscription be forwarded through the secretaries of such societies.—EDITORIAL MATTER. All editorial matter should be addressed to A. R. Jenner Fust, Box 109, Lachine, Que.—or to Ed. A. Barnard, Director of the *Journals of Agriculture*, &c., Quebec.

OFFICIAL PART.

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Sea-weed as a Manure.

M. Chapais, in the French edition of the Journal for October, speaks of the quantities of sea-weed collected by the coast-farmers of the lower provinces, and used as manure for their land. I was surprised to see, when at Métis last year, how little pains the Scotch and Canadian farmers of that district took about this valuable adjunct to the ordinary manure of their barns and stables. On the coast of Scotland, in Cornwall and Devonshire, in Guernsey and the other Channel islands, after a severe storm, or even a heavy ground-swell, large quantities of this curious substance are thrown ashore in the bays and other indentations of the coast, and so valuable is it considered as a ready-made manure for the land, that, never mind what operation of the farm is being carried on, everything is left at a stand-still, and men, horses, carts, the whole strength, in short, of the establishment, are hurried off to the shore to secure as large a proportion of this gift of Providence, before the recession of the next tide sweeps it back into the insatiable maw of the domain of the silver-footed Thetis.

To make as sure as possible of not losing this harvest of the sea, all hands go to work with rakes, *graips* as the Scotch call dung-forks, and dragging the *vraic*—Guernsey for sea-ware—out of the reach of the waves, leave it on the shore till a time of greater leisure. Heavy work it is, and hurried work too; but it pays well, as I had ocular evidence some 40 years ago on the coast-farms of Guernsey and Cornwall; but in those happy districts, there is no rigorous winter, and it is at that season that the greatest abundance of weed is driven ashore; whereas, here, our farmers have to content themselves with the comparatively scanty presents the sea offers them.

On the East coast of Scotland I saw them applying heavy dressings of weed to the stubbles in preparation for roots, the land being afterwards ploughed with a shallowish furrow, to keep the stuff as near the surface as possible, a deeper furrow being given in the spring, I was told, for the purpose of mixing the manure with the soil as much as possible. The Guernseyites, actually cut the *vraic* with hooks like a reap-hook, though rather stouter in make, from the rocks on which it grows, and cart it off the land at once. About 40 one-horse-loads should be sufficient for an acre, though the quality of the weed varies like other manurial matters.

Some of the species of the *algæ* are eatable. I remember well the mournful cry of the Edinburgh sellers of "Dulse and tangle," alternating with "Caller'ou," which inarticulate combination, I was told, meant "Fresh oysters"! On the Welsh coast *laver* was collected in large quantities, cleaned and boiled—in a *silver* saucepan, please, though I dare say a porcelain lined one would do as well—and eaten, boiling hot, with roast mutton: *Epulæ Deorum;* a squeeze of a lemon improves it—*crede experto.*

They said, in Cornwall, that after being exposed to the air for a couple of months, a load of sea-weed would go into a snuff-box. This was of course an exaggeration, but I doubt not that in drying the *vraic* loses two-thirds of its weight.

A correspondent of the *American Agriculturist* says that "Sea-weed is rich in albuminoids, containing from 20 to 25 per cent." What these figures mean, I really cannot tell, as they would be equivalent to, as nearly as possible, 4 per cent of nitrogen, and the weed would be worth at least $9.00 a ton, which sounds absurd In fact, it is very difficult to say wherein lies the value of weed as a manure, for both Johnston and Ure agree in saying that there is merely a trace of phosphoric acid; as for the alkalies, they are abundant enough:

	Sea-weed from Rona.	From Heisker.
Carbonate of soda / Sulphate of sodium	55	85
Sulphate of soda	190	80
Chlorides of sodium and potassium	375	365
Carbonate of lime	100	240
Sulphate of "	95	—
Alumina and oxide of iron	100	90
Silica	—	80
Sulphur and loss	85	60
	1000	1000

Practically, however, there is no doubt about the value of sea-weed as a manure, and I prefer an ounce of practice to a ton of theory.

DE OMNIBUS REBUS.

Cotton seed meal.—Almost all our English dairy-farmers use cotton-seed-meal for the production of butter, and, as far as I know, successfully. Therefore, when I saw that, at the meeting of Agricultural Scientists, at Toronto, in August, Dr H. W. Wiley, of Washington, in his paper on "The influence of food on butter," stated that: "From the milk of cows fed on cotton-seed-meal a butter was produced which fell below the standard of good butter, and would at first sight appear to be adulterated with lard," I was not a little surprised. I do not see why a moderate ration of cotton-seed-meal should injure butter more than a moderate ration of crushed linseed, a pound a day of which, besides improving the health of the cow, I can say from experience adds greatly to the production of butter without injuring its quality.

Wheat in England.—The average (1889) wheat-crop in the United Kingdom is reckoned to be 31 bushels an acre, a little less than 9,400,000 quarters = 75,000,000 bushels. In comparing the *yield* of the crop with the *yield* of other countries, it must not be forgotten that, in England at all events, wheat is sown at least every fifth year on every arable field. In several counties in Scotland and Ireland, no wheat is grown, oats paying better.

Soil analysis.—All my readers know that I have no faith in the utility of soil-analysis. I agree, as I mentioned last month, with Ville, that the way to find out what the plant grown requires to perfect its growth is to make the soil analyse itself. A rather curious experiment has been made in England lately, which, though one should not generalise from a single instance, is not without interest:

The top foot of the soil of a field at Flitcham was found on analysis to contain as much potash as is present in 3 tons of the ordinary muriate of potash of commerce. Two plots of this soil were sown with barley. One of them was supplied with abundant nitrogenous and phosphatic materials for the crop, but without potash. The other had the same amount of nitrogen and phosphoric acid, plus 2 cwt. per acre of muriate of potash. The potash plot gave some 40 bushels per acre of barley, whilst the other gave practically none, for want of 2 cwt. of potash, although the soil contained comparatively so much of it. On writing to the chemist who made the analysis—a very eminent man in his profession—to ask how much of the potash of the soil was soluble or available, the answer was *all of it, more or less.* Now, did the crop result support the analytical judgment in any useful way? Again, this same soil gave on analysis a similar percentage of phosphoric acid to potash. In one case much less phosphoric acid. Yet when the phosphatic manure was withheld, and the potash manure sown, the crop of barley was infinitely superior to that upon the plot from which potash was withheld. And who would have thought it?

Superphosphate.—Again, I have to remark that it is a thousand pities farmers who write for information on the question of manures will persist in using the vague term *phosphate.* "I put so many pounds of phosphate on an acre," we constantly hear, the inquirer never giving any notion of the constituents of the manure he has been employing. Superphosphate, or dissolved phosphate, as it is sometimes called, is made especially to supply the crop with phosphoric acid and nothing else, though, owing to the mode of manufacturing it, there is always a considerable per centage of sulphate of lime—land-plaster—present.

The real benefit derived to the farmer from Liebig's suggestion is that rocks and stones containing phosphoric acid in a stubborn form are rendered soluble and fitted to supply food to plants by the simple addition of a cheap form of acid to the rough material. The process of manufacture is in short this: apatite, Carolina-rock, coprolites, &c, pass from the grinding rollers to the tank, a certain amount of sulphuric acid and water is added, the masher, as we brewers should call it, is started, an amount of heat is generated by the combination of the ingredients, accompanied by a pungent odour, the mixture is put away into a receptacle of some sort, and, after resting for a week or so, becomes dry enough for use.

During the process, a very remarkable change has taken place in the phosphatic rock: a large proportion of the phosphoric acid which had been insoluble in water has become soluble in that liquid. Take, for example the finest ground apatite you can find, and after mixing it with water, in any convenient vessel, add to it a little liquid ammonia: you will find no precipitate on the bottom of the vessel.

Now, go through the same process with a mixture of superphosphate—mineral phosphate dissolved in sulphuric acid—and after the addition of ammoniacal liquor you will observe that the solution has become a solid glutinous mass, consisting of what is called precipitated phosphate. Lime would have the same effect as ammonia.

You see, then, clearly, what is meant by soluble phosphate, and why superphosphate is valued in proportion to the quantity of phosphate rendered soluble in water it contains. Theoretically, a perfectly pure phosphatic rock, (one containing 100 °/o of phosphate), mixed with perfectly pure sulphuric acid, should yield 61 °/o of phosphate, the balance—39—being the acid employed. Practically, however, the raw material is never found pure: carbonate of lime, sand, &c., are constantly present. The carbonate of lime consumes acid enough to convert itself into sulphate before the phosphate can get attacked. Some part of the rock-phosphate is often found undissolved, and, in calculating the value of a superphosphate, the manufacturer should make no claim for this undissolved rock; the mere fact of its existence in the completed article proving it to be of a *peculiarly stubborn* character, or else that it has been insufficiently ground, and in either case, useless to the farmer.

But, with what is termed *reverted* phosphate it is not so. As we saw just now, lime added to a mixture of superphosphate and water, converted it into a solid gelatinous mass; and so, in the soil, the lime always present, acts on the superphosphate after it is spread, and precipitates the *soluble* phosphate, converting it into an *insoluble* condition. Now this altered condition would seem at first sight to be an entire nullification of all previous operations, but in truth, an article like apatite—which in its raw condition, however finely ground, is absolutely insoluble in water—once resolved into solution, is made easy of assimilation by the plant, notwithstanding that it is precipitated by the elements in the soil, because in its precipitated form it is in an infinitely finer state of division than any imaginable process of grinding can produce. It is, therefore, I think, quite fair that the proportion of reverted phosphate contained in any superphosphate should be charged for by the manufacturer, though I also think that the lower the proportion the better. Why soluble phosphate reverts into the insoluble state in a carefully made superphosphate, I really cannot explain, but it certainly does so.

The following factors may be found useful in connection with the subject of artificial manures in general:

AMOUNT OF	MULTIPLIED BY	GIVES CORRESPONDING AMOUNT OF
Nitrogen	1.214	Ammonia.
"	6.3	Albuminoids.
Ammonia	3.882	Sulphate of ammonia.
"	3.147	Muriate of "
"	3.706	Nitric acid.
"	5.0	Nitrate of soda.
Potash (anhydrous)	1.85	Sulphate of potash.
"	1.585	Muriate of "
Phosp. acid (anhydrous)	2.183	Phosphate of lime.
"	1.4	Biphosphate.
"	1.648	Soluble phosphate.
Soluble phosphate......	1.325	Phosphate of lime.
Biphosphate	1.566	" "
Lime	1.845	" "
"	1.786	Carbonate of lime.

Phosphate of lime means tricalcic phosphate; what chemists call $CA_3 P_2 O_8$ that is, 3 equivalents of lime, 2 of phosphorus, and 8 of oxygen.

The reverse of this of course holds good. If we want to know, for instance, how much nitrogen there is in 25 lbs. of ammonia we *divide* that sum by 1.214, and find the answer to be $\frac{25}{1.214} = 20.14$. Practically speaking, 14 of nitrogen are equal to 17 of ammonia—exactly, to 16 996.

Superphosphate exerts a wonderful energy on grass-land. I remember an instance, in England, where a farmer sowed 5 cwt. an acre on a worn out pasture, in the spring, and in the latter part of the summer the piece was one mass of white clover, and every cow turned into the field made at once to the part manured. On the real *grasses* it has little or no effect; they require nitrogen.

In the States, phosphoric acid—soluble and reverted taken together—is worth 6 cents a pound; therefore, a superphosphate containing 10 °/₀ should be worth $12.00 a ton of 2,000 lbs. At Capelton manure-works, the price is $12 50, free on the cars, which, considering cartage, bags, &c., does not seem to be out of the way. In fact, we cannot expect to get it cheaper, though I wish the firm would make a higher grade containing say 15 °/₀ of phosphoric acid—the carriage would be less per unit. In England, they make it as high as 20 °/₀; there we always speak of *soluble phosphate*, here of *soluble phosphoric acid*, but by means of the above factors, the computation of the equivalents is easily made.

Worn-out pastures.—It must take a long time to render some pastures unfit to rear cattle and bring them to maturity. I mentioned in one of the previous numbers of the Journal several facts in connection with this subject—the grazing pastures of central Engrand, the chalk-downs, &c.—, none of these are over manured, and still cattle and sheep after hundreds of years do well on them! Take our Deer-parks, for instance. One of these I know pretty well. It consist of 800 acres of poor light land on the chalk, and the regular herd of deer kept on it is, young and old, 800—just one to the acre. No manure is ever applied, and no extra food is ever given, except in a deep snow, which is not encountered once in ten years. The deer feed down along the same track to the water—the river Darent—every evening, and although this has been going on ever since the first Baronet's time—1673—the keepers' books show no diminution in the weight of the bucks, and to judge by the pace at which they scamper away over very rough land, their bones are still firm and their sinews elastic.

Shorthorns.—The sale of the Duke of Devonshire's herd of shorthorns, at Holker, was satisfactory. Bulls averaged $530.00, and cows, $520.

Prizes for sheep.—Are sheep considered in our country parts as relatively inferior in value to cattle? I ask this question because, although at the local exhibitions prizes are offered for bulls, cows, &c., of specified breeds, sheep are lumped together, without any distinction, e. g.: "Prize for the best ewe; do, for the best ram"! This is even worse than offering prizes for the "best Oxford *or* Hampshire ram," as at the Sherbrooke show; an error that I hope will be corrected before the next season is over.

Top-dressing.—A curious little catechism closes the September No. of the crop-report of the State of Georgia, from which I cull the following choice specimens:

"Tobacco, rape, beans, *lucerne*, &c., and all other top-rooted plants, require a deep soil, as well as the cereals, which are supposed to grow near the surface, whereas the roots grow equally deep in the soil if they find rich loose earth."

I have traced the roots of *lucerne* down four feet in the subsoil, but I never found the roots of oats extend more than six or seven inches at most. Wheat, too, requires a firm well packed seed-bed.

The best way to use chemical fertilisers for fall wheat, we are told, is "to harrow until a smooth surface is made; spread the fertiliser broadcast, and harrow until well mixed with the loose soil." Fancy, in a climate like that of Georgia, sowing sulphate of ammonia or nitrate of soda in the fall! How much would be left in the land at Easter?

"Eighty-eight pounds to 176 lbs. of sulphate of ammonia, or 132 to 176 lbs of nitrate of soda mixed with 220 lbs. of plaster may be sown broadcast in March." Plaster has no effect on wheat or other cereals, except, perhaps, where lime is entirely absent, a very rare occurrence; but, continues the catechism, "I prefer the use of 176 lbs. of superphosphate, with 176 lbs of plaster when the grain is up late in the fall, to the use of sulphate of ammonia and plaster.

Of course the writer has been reading Ville on Chemical Manures, to the neglect of Lawes and Gilbert. The latter prove clearly enough that nitrogen is *the* manure for wheat, and that without it, the mineral manures, superphosphate, potash, plaster, &c., have no effect, though in combination with it, they answer well.

In every climate top-dressings of chemical manures on grain-crops should be deferred to the early spring. Where potash is required, as it takes a long time to become fit for roots or potatoes, it might be applied on land intended for roots or potatoes, in the fall, unless in countries where the snow-fall is heavy, and where, in consequence, there is a risk of its being washed away.

Sulphate of ammonia for mangels may be sown on the manure in the drills, but nitrate of soda should be broadcasted after the second horse-hoeing.

Nitrogen.—The price of nitrogen in England to-day, in nitrate of soda, is 13 cents a pound. In sulphate of ammonia it cost fifteen cents. At Pacey's works, Hochelaga, it can be bought for 16 cents a pound in sulphate of ammonia.

Where land is in good heart, 30 lbs. of nitrogen and 40 lbs. of soluble phosphoric acid, without any other manure, should produce a good crop of wheat, barley, or oats. This dressing would cost about $7.00 an acre, and ought to pay even at our terribly low price of grain.

Strawberries.—A very handy compendium of the best way of growing strawberries is published by the Director of the Ottawa Experimental Farm. The writer, Mr. W. W. Hilborn, Horticulturist to the Station, evidently knows what he is about. I particularly admire his advice on "Growing strawberries for family use":

If the following system is adopted, a crop of strawberries can be grown as easily as one of potatoes and with as little risk of failure :—Select the best piece of land procurable, where the plants can be cultivated with a horse cultivator in the same manner as corn or potatoes. For a family of ten or twelve persons, four rows two hundred feet long will give an ample supply for from three to five weeks, if suitable varieties are selected and reasonable cultivation given. Suppose the plot chosen to be forty feet wide and two hundred feet long. Plant four rows, covering one-half of the plot, as early in the spring as possible, four feet apart and one foot apart in the rows.

Cut off all the blossoms and first runners until the plants have sufficient strength to send out several strong runners at once (which is usually in July) when these may be allowed to take root. Stir the soil occasionally with the cultivator and keep the ground free from weeds. The second half of the plot should be well manured and planted with potatoes, and after these are dug in the fall the land should be prepared for planting in the following spring. Plants of the best quality can be obtained from those first planted for this second plot. By following this system a full crop of fruit can be gathered in about fourteen months from the time of planting.

As soon as the last berry is picked, plough up the first plantation, add manure and again prepare the land for planting the following spring. But one crop of fruit is taken from the plants and less time is required on putting out a new plot every spring than in cleaning out the old one. With this method there is no difficulty in keeping up a supply of strong and vigorous plants for replanting—a most important point in successful strawberry culture. A plantation can be made to bear well for several seasons by cleaning out the rows as soon as the last fruit is gathered, cutting them down to about six inches in width and giving thorough cultivation until the autumn; but more experience is required to manage the plants under this method than with the renewal plan.

One row each of the following varieties :—Crescent, Wilson, Captain Jack, and Manchester, will make a collection that will give a succession of fruit for a month in a favourable season. In any locality where other sorts are known to succeed and are more easily obtained, they can be used in place of those named. It is of great importance to procure plants as near home as prossible, or from those who will take much care in packing them. Failure is often due to the careless handling of the plants while out of the ground or to want of care in packing them.

Harvesting potatoes.—Potatoes are, or ought to be, a cleaning or fallow crop; wherefore I do not like to see them left on the ground two months after they are ripe; for to say nothing else, the haulm being once dead, the weeds get a chance to revel in the rich earth, to ripen and to scatter their seed. A poor crop indeed of this esculent! The Huntingdon folk are importing their potatoes for the winter from Ontario, and even on land full of dung in this neighbourhood, the tubers are small and of inferior quality. In England, the crop is enormous, and it would not surprise me to see a good many ship-loads arrive thence in the spring at both Canadian and States' ports. As for foulness, I never saw land in such a condition as it is this autumn. Below Quebec, at Métis and so on, potatoes are selling for 37½ cents a bags; here, they ask $1.20!

Silage corn.—Neither Dr. Craik, of Ardgowan, nor the Messrs. Dawes, have nearly room enough for their corn in the siloes. Such a lot of it! Some stalks 15 feet high! And now, Oct. 9th, more than half the crop is still standing, the leaves all dead and withered of course; but their managers must not be blamed for that as the weather has been awful. Ten acres of second cut clover too, utterly spoiled, and lying in the field for manure—20 tons, at least I never saw such a second crop! If it had only been ensiled as fast as it was cut!

On this subject, ensiling clover, I was pondering the other day, and I made out the following calculation, in accordance with Wolff's analysis of two plants, clover and fodder-corn, as ensilage :

DIGESTIBLE NUTRIENTS.

	Water.	Albuminoids.	Carbhydrates.	Fat.	Nutritive ratio.
Maize...........	82.00	1.00	10.19	0.54	11.4
Red-clover	79.20	3.06	8.10	1.70	4.00

Now if we add the fat to the albuminoids in each case, and multiply the product by 4.30 cents, we shall get to pretty nearly their value, and the carbhydrates multiplied by .9 of a cent will be about their worth: the two sums added together will give the value per 100 lbs. of the whole; thus :

Alb. Fat. cts.
For the corn; 1 + 0.54 = 1 54 × 4.30 = 6.62
Carb. cts.
And 10.19 × .9 = 9 17

15 79 cts. per 100 lbs.

For the clover; 3.06 + 1.70 × 4.30 = 20.46
And 3.10 × 9 = 9.33

29.79 per 100 lbs.

So we see that corn-silage is worth very little more than half as much as clover-silage.

But this is not all. On corn-silage alone, animals would soon starve; and this is true practically as well as theoretically, its nutritive ratio being as 1:11.4; and that of the other, 1:4 being a perfect food, clover is clearly of much greater value than corn, look at it in whatever way you will. Not that even clover-silage should be given to any stock alone, on account of its mechanical condition it would probably scour the beasts frightfully.

To get at the *value per acre* of the crop I will take the two grown on the same farm in adjacent fields, probably in a nearly equal state of fertility, I mean, of course, the clover and corn-fields of the Messrs. Dawes.

The corn, I judged, in September, to be likely to yield about 25 tons to the acre, and I do not think I underrated it. The clover had certainly 3 tons of hay an acre to its first crop, and more than two for the second crop; but let us say 2 tons: making five tons in the two cuts. These 5 tons of hay would have required certainly 20 tons of green clover to account for the difference between the crop standing and the hay made from it. Thus, we arrive at the following figures.

	tons.	cts.	
Corn.....	25 = 50,000,	at 15.79 per 100 lbs =	$ 78 95
Clover...	20 = 40,000,	at 29.79 per 100 lbs. =	119.16

Leaving a balance of $40.21, per acre, in favour of the clover, to say nothing about the comparative cost of the cultivation of the two crops, which, of course, is very great.

Of one thing I feel very certain: on farm manured and cultivated as are those of the Messrs. Dawes, on which a second cut of clover can be reckoned upon every year, it would pay the proprietor to build a silo expressly for this purpose. Though our early hay is generally pretty sure of a good season for making, the aftermath has generally to be fed off, on account of the weather being, in September, too 'catching' to risk the mowing of it for hay, second cut of clover being, for some reason or other, almost as easily spoiled by a shower when nearly made as tares are.

Modes of cultivating potatoes.—How opinions differ about the simplest agricultural processes! Marion Wilson, of Fairfax county, Virginia, holds that "the chief causes of potatoes rotting are due to improper planting and cultivation As far as my observation goes I have never seen potatoes planted in drills, and hoed culture adopted, that proved a success. When a boy, I was taught to plant potatoes in hills and rows. The first hoeing was mainly to cut up the weeds and the grass, and to loosen the soil; the second time, the hills were rounded up as large as a bushel-basket or larger. This treatment always insured a yield of from 350 to 400 bushels, while drill planting and cultivation (*horse hoeing, I presume*) seldom yield more than from 150 to 200 bushels to the acre."

Mr Wilson misses two important points: 1st Since he was a boy, the land of his state has been pretty well scourged by injudicious cropping; and 2nd, labour is so much higher now than "before the war," that without the horse-hoe and the double-mouldboard plough, the crop in question could not be cultivated profitably. As for the drill system of potato-planting causing the disease, that I need not say is an absurdity; but there are still people who persist in earthing up their potatoes to an extravagant height. I am convinced, after much experience in growing potatoes in all kinds of soil from the *plastic* clay of Kent (England) to the light land of Sorel, that planting the sets in deep, 24 to 30 inch drills, with very little earthing up, will prove to be the best way to insure a good yield. Why confine the rootlets of the plant to a space of 12 or 15 inches, when you might let them wander over 24 or 30? Then, the earthing-up should leave a flat top to the drill, to prevent the rain, of which, in ordinary seasons, we do not have too much, from running off into the open furrows and so into the ditch. In fact, except on heavy clays, I should not earth up at all, but horse-hoe as long as I could without hurting the haulm, and if a few of the tubers were greened by the sun, I would keep them for seed. In practice, I earth-up no crop. My corn—Stowell's evergreen—9 feet high, stood the gales of this most exposed situation without one stalk going down. On heavy clays, in low situations, running the plough between the drills may be a necessity, but as surface drainage, not as a part of the process of cultivation.

Folding sheep.—Who G. G. the writer of the following article in the "Country Gentleman" may be I know not. One thing I know, he has the root of the matter in him:

Folding or penning sheep.—It is the penning of sheep so as to eat forage and root crops on the land by moving the pens or extending them day by day, which enables English and Scotch farmers to keep such great numbers of them in comparison with the few found on the farm in the United States. It is also this system of folding which enables the shepherd to pay so much more attention to the flock, and keep them in uniformly thriving condition from their birth till sold to the butcher, and also it is the reason why on every farm of any importance there is a shepherd who has generally become an institution, for on good farms the best of workmen are employed, and seldom change places. The climate of Great Britain permits sheep to remain in the open air day and night all the year round, and there are very few which are ever put under cover, ewes, for a short time, when they have lambs early, so this penning of sheep is better than soiling, for it not only saves the hauling of the crops to the homestead, but costs nothing to cart out the manure, as that is returned at once from the dung and urine of the animals dropped regularly as they are moved daily on fresh ground, and the oilcake from the United States, which is given to fattening sheep, has an extra value in the extra worth of the manure.

If southern planters could keep enough sheep to have a shepherd, their winters would allow of folding, and enriching their fields for cotton crop by eating crops of turnips, rape and early forage, with cottonseed meal, &c., to put flesh, fat and wool on sheep, and fine, fat fertility on the soil penned over by the flocks. Stress is laid on having a shepherd, for when one is not employed, and there is no regular system of management, there will soon be no flock worth looking after. If the fields, which lie in weeds in the South, resting as it is called, could be growing early forage with some crops to follow, such as rye to commence, then clover, millet, rape and turnips; mutton and wool would make double what cotton does now, and from the soil enriched by the droppings of the sheep the cotton would be double what it formerly was.

As now the land has to be fertilized by purchased manure, if that was used in future to increase the bulk of the forage to be eaten by the sheep, nothing more than the fertility left by the sheep would be required.

It is very plain to be seen that the English farmers could not pay their rents without the system of sheep husbandry, on the arable districts at any rate, therefore it seems well worth while to dispassionately consider this subject. G. G.

Arthur R. Jenner Fust.

Suggestions in Harvesting Corn.

There are several operations in connection with the harvesting of corn, which may be worthy of suggestion to the younger and more inexperienced portion of our readers.

Mowers and reapers may be employed for cutting the stalks, where the smaller northern varieties have been planted. A small reaper will cut one row, a large one may take two rows, although with more inconvenience. The large southern corn is too coarse for cutting with a reaper. If the ground has

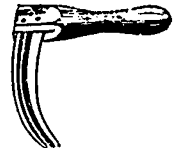

Fig. 1.

been softened with rain, the wheels sink too much and the work will be difficult. There are many instances, therefore, when the cutting must be done by hand. For this purpose a common sickle answers well, or the cutter made on purpose, fig. 1. Where corn has been sown thickly for fodder, and the stalks are small and not encumbered with ears, a self binder has been successfully used, where the ground has been

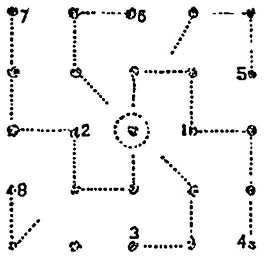

Fig. 2.

sufficiently firm. It is probable that in future wider wheels will be given to the reapers for this purpose.

In cutting up by hand, labor will be saved by adopting a regular system of steps. The accompanying plan of the 25 hills forming a shock (fig. 2), shows by the numbers how the

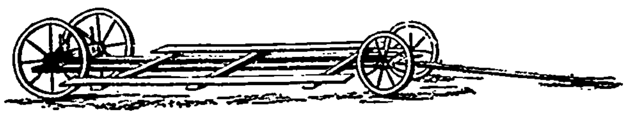

Fig. 3.

operator begins and completes the work. He takes three hills at a time, beginning with number one. Many steps will be saved by adopting such a system. With small corn, a

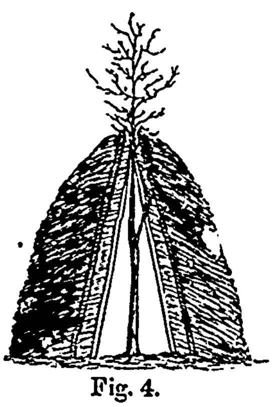

Fig. 4.

greater number of hills may be taken at a time, and larger shocks made.

The small northern corn, when sown for fodder, gives a heavier return when planted thickly, the more numerous stalks

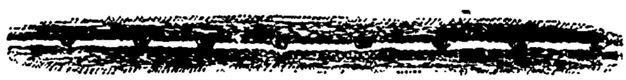

Fig. 5.

making up for the deficiency of size.

For drawing the freshly cut corn, for clearing the ground, or for conveying it to the silo, the wagon represented by fig. 3 is very convenient, the platform on which the corn is placed being only a foot above the ground. It consists of a long, broad frame, suspended by chains under the axles of a common farm wagon. A reach 20 feet long gives sufficient length to the platform, and places the two axles 18 feet apart. Cut this reach from a green tree, curving downwards a foot. Small sized shocks of cut corn are placed easily and rapidly on this platform and drawn off the field.

Corn fodder, sown thickly, is very apt to heat and spoil when placed in a stack without ventilation. It is necessary,

Fig. 6.

therefore, to provide a chimney in centre for the steam and hot air to escape. A moderate-sized tree, with two three rails placed about it in an upright position, answers a good purpose fig 4. In the absence of a tree, two or three rails, or longer poles of any kind, may be set upright a foot apart.

Straight Rows.—Farmers who have tried the advantages of straight rows and the defects of crooked ones, will now have an opportunity of observing their comparative value. A straight row may be cultivated leaving very few weeds; the crooked one will be more or less infested with them. Fig. 5 shows a straight row, and the close cultivation to the plants; fig. 6 a crooked row, where it is impossible to work closely to the row without tearing up a part of the corn.

How to Grow Fine Celery.

STORAGE.

So far, this season's weather has been all that could be desired for setting out the plants and also for stirring the soil about them. As the season advances, do not omit cultivation and working as described in the last paper, for it is every bit as essential to the well-doing of the late-blooming celery as it is to any of the earlier crops. Only with the latter, the many weeds springing up rendered cultivation imperative, while now with the crop under consideration, but comparatively few weeds are likely to intrude, so that it may appear to some needless to work them, but it should be remembered that cultivation is to be done for the benefit of the growing crop, not merely for destroying weeds, this being largely incidental to the cultivation.

But now although the plants may have been first class, the soil very thoroughly prepared, the planting properly done, and a very fine growth secured, yet the most important part of the process of preparing celery for market is yet to be considered; its importance is mainly due to the fact that the bulk of the demand for celery comes during the winter, so that the crop must be so stored as to preserve it from frost, in such shape that it will bleach and in a situation free from water during the winter. I propose in the present article to describe the method of storage employed by a grower, Mr. Phillip Wall, near Buffalo, who has this season nearly a hundred thousand planted.

Mr. Wall's land is of a mucky, swampy nature, well drained and capable of producing celery of as fine quality as comes into the Buffalo market. In order to extend the season as much as possible, he has (after many years of experiment) come to follow the plan of storing about half his crop in trenches out of doors, but well protected, and the other half in the cellar, which is close to the field in which the celery is grown, as on one side is a slight elevation which was utilized in its construction. It was dug out along the side of the hill, which in the cross section, fig. 1, is shown at *g* and which forms one side 4 feet high, while a stone wall *e*, 2 feet thick, also 4 in height, forms the other side, the ground from the excavation, being thrown up against it from the outside, as shown at *f*, the rear end being like the front side. The front end, as well as the doors, which open inward, large enough to admit one horse loads, is made of a double thickness of 1 inch boards, having a space of 6 inches filled with sawdust; the sides and rear are lined with inch lumber, and boards a foot wide are placed on edge lengthwise on the floor, as at *d d*, which represent paths between the celery spaces *c c c*.

The roof is so made as to combine lightness, strength and warmth; *a* represents inch boards sawed to a length that would form a span, the peak of which would be 2 feet higher than the side walls, or 6 feet from the ground, thus allowing a man or horse to go in without difficulty. After the first board is down, a layer of straw *b b* is put on it, thick enough so that when the second board is pressed down firmly the straw will be ? foot deep; on the second board another similar layer of straw is placed, which is then lightly covered with matched boards, the cracks of which are well battened also, in order that no water may soak through. The outer edges of the roof are treated as shown in fi. 1; wherever the soil is not sufficiently porous (as in the case with Mr. Wall's), at *g*, to allow of the free escape of water from that side of the roof, a tile or or other drain should be provided, as no water must enter the cellar. On the *f* side, the water will take care of itself. At equal distances from the centre to the sides an upright support *h*, consisting of a 2 by 4 scantling of the proper length, about 5 feet long, is set on a brick, while at the top, an inch strip 4 inches wide is run the entire length of the roof, which in this case is 100 feet, 12 supports being used on each side, 24 in all.

In the front end two windows are placed as seen in fig 2, for in this building celery is prepared for market during the winter, and some light is necessary while it is not sufficient to interfere with the blanching process. In storing the crop as fast as the plants are dug, some earth being left on them, they are loaded on a one-horse wagon which is then driven through the centre clear to the farther end where the roots are packed as close together as possible, upright on the ground floor, in the three spaces *c c c*, the packing being carried forward while the horse and wagon is each time backed out, until the space is filled up to six or eight feet of the door. Thus packed, this cellar will hold between 40,000 and 50,000, and this is marketed along from Thanksgiving until the fore part of January, after which the trenches are opened and the celery sold off by early spring.

Mr. Wall's land where the celery is stored being of a sandy character affords excellent natural drainage, so that making trenches or other receptacles for storing is only a simple matter of selecting the most convenient place, and then digging to the proper size. In our immediate neighborhood, on the other hand, it is far different, as we have no natural drainage whatever, the soil being not at all sandy and the subsoil an extremely non-porous clay; but as illustrated in fig. 3, a little extra expense for tile, and for digging the trench a little deeper will enable one to overcome the peril of water standing about the plants during the winter. This matter of water while the celery is in storage, we might say for the benefit of more inexperienced readers, is the one important point in the safe keeping of celery, numberless being the instances to our knowledge when the fruit of an entire season's work was completely ruined through not sufficient care being taken to prevent the gathering of water, which completely rots the stalks.

The trench at fig. 3 is dug of whatever size is considered the most convenient, the depth being regulated by the length of the celery stalks, the top leaves of which should be several inches above the surface of the soil. The tile is laid along the bottom, and about six inches of soil placed over it and firmed somewhat; the drain of course having sufficient fall to allow the water to be quickly carried off—a fall of an inch to a rod having proved quite satisfactory. As many of such trenches can prepared as may be required previous to commencing to dig the celery, and then the packing will proceed quite rapidly.

For protection during the winter (the storing not being done either in cellar or trenched until danger of severe freezing) the trenched celery is first covered with a thin layer of leaves or straw, and as the weather becomes colder the covering is gradually increased in thickness, until by the time hard winter weather is at hand the cover will be about two feet thick.

We may add that the estimated cost of this house was something over $100. Hemlock lumber, rough but good, of good quality and matched, was used for the roof—it requiring something over 5,000 feet. The sides, ends and wall use 1,350 feet, while the scantling for roof supports measured 250 feet, making a total of 6,700 feet, the price per thousand being $12. The cost of erection is but slight, but of course will differ in various localites, as will also the price of lumber. For the stone wall no special expense was incurred, as the stones were right at hand and no skilled labor was required to put it up; of course where stone must be purchased, such item must enter into the calculation.

E. E. SUMMEY.

Niagara County N. Y.

Your correspondent, Mr. Wilson, can learn much more by standing over his cows and feeding them himself than by consulting a chemist as to the rations to feed. To illustrate, under chemical analysis, it is admitted that late cut timothy hay is richer than early cut, and yet the cow's laboratory will find more nutriment in the early-cut timothy.

It will be noticed that I have said above that I could take any good Jersey cow that was giving four gallons of milk, and by feed reduce the flow of milk and increase the quantity of butter. I cannot do this with every one. I have found some to increase the quantity of milk under my system of feed, and have almost invariably found that they proved failures in the test room.

Just here is why the experiment stations is misleading. They take two or three cows, or half a dozen, and they may or may not get good butter cows with which to experiment, and then all cows are to be judge alike. The general public will find it more to their interest to do their own experimenting, and they will find that cows must be fed as individuals; that you may have a sort of general idea as to feed, but each individual must be studied. With this I now dismiss this question, and say that I do not intend to be drawn into any controversy, and I have not the time or the inclination to dispute over a matter that does not concern me.

Country Gent. W. J. Webster.

Growing Fine Pansies.

JOHN. F. RUPP, CUMBERLAND CO., PA.

The Pansy has undergone wonderful improvement within the past few years. This summer I have had Pansies which were as near perfection as could well be looked for. They were very large, of circular form and of the most beautiful color. Many persons came to see them, and the invariable comment was that they were the finest Pansies they had ever seen. In the following I give my method of growing these perfect flowers.

Seed of the very finest varieties bought from reliable seedsmen, was sowed early in August in a well-prepared bed. The seedbed was located in a well-aired, sunny spot in the garden; the ground being sifted to a depth of about three inches, and a good amount (about one fourth) of finely rotted stable manure mixed with it. The seed was sown thinly in drills one fourth inch in depth, the ground firmly pressed, and light watering given. The bed was at once shadedwith a muslin sash raised eight inches from the ground. This shade remained until the plants were up, when a lathe screen was substituted, which was removed when the plants had made a good growth.

The ground had not been allowed to become very dry, a sprinkling being given promptly as the surface dried. At the time of sowing the seed I also prepared a compost by mixing in a heap of equal parts of cow manure and good garden soil, letting it remain until wanted for use. In the begining of October the Pansies were transplanted into a bed, made close against the east side of the dwelling house, and prepared by digging to a depth of twelve inches, throwing out the clay or any poor soil, then putting in the compost of cow manure, having it well mixed and tramped in quite firmly until the bed was full.

The plants were then set in at a distance of six inches apart each way and kept well watered until established.

Late in the fall a heavy mulching of finely rotted manure was given to protect the plants from severe freezing. Early in the spring this was removed from close around the plants, allowing it to remain on the bed. When they began to bloom all the flower-buds were pulled off until the plants attained a good, strong growth. The flowers then were of very largest and finest. All not producing flowers up to the standard were pulled out, so that seed of none but the finest would be gathered. When the ground became somewhat dry, a good watering was given. The bed being in shaded situation it was protected from the hot afternoon sun and produced a perfect mass of Pansies during the entire summer.

By giving them a little extra care and selecting a protected place for the bed, any person can grow Pansies to perfection, and can find a source of exquisite delight when looking into their beautiful, smiling faces.—*Popular Gardening.*

BEAN CULTURE.

Eds. Country Gentleman — A reader of your paper residing in Kentucky, asks for an article on bean culture, and requests that I go into details, so as to cover all the operations of planting, cultivating, harvesting and preparing for market. This I will gladly do, although a part of the work of the present season is already done. As an introduction I will say that perhaps no other crop will give as large profit on thin land as beans, and certainly no crop that I am familar with will leave the land in as good condition for a wheat crop, and for these reason I like to grow them. The only serious disadvantage in the management of the crop is the liability of damage by wet in the fall, making it necessary to pick them over by hand, which is tedious and expensive.

Beans should not be sown until June, and in my latitude I sow as near the 10th as the weather will permit. This is for the Navy, but the Marrow will bear sowing later, and I have put them in July 4, and harvested them Sept. 12. I advise early plowing, however, in order that any weed seed may start and that the land may be clean and mellow at seeding-time. It is, I think, a great damage to the bean crop, on clay land especially, to have a heavy rainfall soon after they are sown, as it is liable to cause more or less of the seed to rot, and if the land is packed hard the plants come up weak and start slowly, and a crop of weeds start with them. So I advise that the land be made ready and the seed sown early in June, as soon after a rain the land will work nicely, and if the beans come up before the next rain and get a start to grow, it is a great advantage. We sow with the force-feed wheat drill, and use from three pecks to a bushel of seed to the acre, but as we do not use all the hoes you cannot set the drill by the gauge, but must measure out a few quarts and test the drill on a measured piece of land until you get the right quantity. Our drills are set to sow wheat eight inches apart, and in sowing a bean crop to be cultivated by horse power, I use every third hoe, which makes the rows two feet apart. I have seen large fields sown by stopping only every third hoe, sowing two rows eight inches apart, and then leaving a sixteen-inch space. When sown in this way the beans are not cultivated at all, and are harvested by cutting with the mowing machine, and this close planting is to enable the beans to shade the land quickly and prevent the growth of weeds. When the crop is cultivated, avoid throwing earth to the plants, as the ends of the pods are likely to be damaged by it, and make it necessary to pick them over by hand.

The ordinary way of harvesting is to pull by hand, and the beans are laid roots up in rows, leaving room for a wagon to be driven between them to load. The beans ought not to stand until ripe, or there will be loss from shelling, but most of the pods should be yellow. If they can be put on racks with a chance for a circulation of air between them they may be pulled before any of the pods turn yellow, and will cure out and make a very bright salable article, and when but an acre or so is raised and there is plenty of barn room there is less risk in this way than any other. Beans may be left out through heavy rains until the pods are quite black, without any damage to the bean, if they are spread thinly on a closely trimmed hedge or rack, or on the tables of a field where broom-corn has been cut, as the rain will run through them and they dry out soon.

With a large crop, a threshing machine is sometimes used to thresh them, but they can be threshed so cheaply and well by tramping with horses, that I always employ this method Do not try to thresh them in damp weather, but either during dry hot weather in autumn, or in zero weather of winter, they will become so dry as to thresh very easily. Be sure and have barn floor well covered, as if there are thin places the horses will split some of the beans which injures their appearance and sale, but with a foot or so of vines between their feet and the floor this cannot happen. Clean with the fanning mill, and if there are no spoiled beans they may be sacked for market, but if there are, they must be hand-picked.

I generally give this job out to women, and can get them picked over at 35 cents per bushel, if not very bad, but sometimes it costs 50 cents. If I have omitted any details I will gladly answer any questions that may be asked.

WALDO F. BROWN. *Butler County*, O.

MILK.

SUMMARY.—Introduction.—Normal milk.—Its density.—Composition.—Fat-globules —Nutritious value of milk.—Its elements.—Compared with meat and eggs.—Milk a perfect food.—Comparative value of milk in its different conditions.—Variations and deterioration of milk.—Their causes.—Diversity of races.—Ages of cows.—Their habits.—Health of animals.—Medium in which they live.—Food of milch cows.—Their fitness for milk-production.—Effect of milking.-Time of calving.—Age of milk.—Ferments or microbes in milk.—Medium in which milk is placed.—Accidents to which milk is subject.—Poisonous milk.—Poor milk.—Galactorhœa.—Bitter milk.—Salt milk.—Milk with rotten-egg flavour.—Milk that sours or coagulates on leaving the udder.—Purgative milk.—Viscous milk —Milk that will not curdle.—Milk, the butter of which will not "come."—Clotty or grumous milk.—Milk which curdles in boiling.—Blue milk.—Yellow milk.—Green milk.

LECTURE BY M. J. C. CHAPAIS.

Mr. President and Gentlemen,—The work our society is pursuing is of a complex nature. Its principal object is the development of the dairy-industry. To succeed in this development, it must endeavour to give to its members a complete theoretical course of instruction bearing upon all the branches of the industry, and place within their reach that practical information without which all theory is inapplicable and useless.

The practical part of its work is carried on by our society by means of dairy-schools, of a well planned system of inspection, and of practical lectures in the making of cheese and butter. As to theoretical science, we labour for its dissemination by these annual meetings, by the lectures that are here given, by the memoranda of the inspectors which we lay before the public every year, and specially by our published reports, in which are to be found all the lectures and essays which are submitted to us at our meetings or elsewhere.

From any point of view, the printed reports of our society, which I have just mentioned, are the most powerful agents for the propagation of the theoretical science of the dairy-industry which we have in hand. It is therefore necessary that they include the *data* on all the numerous questions allied to that industry, so that whoever desires to consult them may find there all the information he may want to help him to dive into the *arcana* of the science he desires to study.

INTRODUCTION.

It is in virtue of the principle I have just laid down, that I have selected to-day "MILK" as the subject of the lecture I have been invited to give before you. Indeed, as, some time ago, I was running over the series of reports of our society, for the purpose of reference, I observed that, almost all the subjects allied to the dairy-industry had been then treated in a special manner, except the one I consider the base of all the investigations which our society makes, or causes to be made, in pursuit of the accomplishment of its work.

Here and there, indeed, a word or two about milk has been dropped as if by chance. The way of treating it in making butter and cheese has been shown. But nothing special has been said on the subject of its nature, composition; nutritive value, the variations and changes it undergoes, of the accidents it incurs, before it enters the butter, or cheese factory. I say *nothing*, and that is rather a strong expression; but it will be allowed that these points have only been summarily touched upon, beyond that which relates to the immediate connection with butter and cheese of which milk is the raw material.

I am here then for the purpose of filling up what I conceive to be a void in the reports of the society, regretting all the same that others more expert than I have not undertaken to do it before.

To throw more light upon the points I am about to treat, I have divided my essay into three distinct parts: in the first I shall speak of *milk in its normal state*, in the second, on the *variations and changes of milk*, and, in the third, of the *accidents that befall milk*.

MILK IN ITS NORMAL STATE.

Normal milk is milk as it comes out of the cow's udder, before it has undergone any changes by contact with the air. At this first phase of its existence, it is made up of the following elements, whose proof is due to a great number of analyses. I give three series of these elements; one comprising the *maximum* of solid matters, another the *medium*, and the third giving the *minimum*.

The analyses of Doyère give the following result:

	Max.	Med.	Min.
Water	82.67	87 60	91.01
Fat	5.40	3.20	1.90
Casein and albumen	5.80	4.20	2 99
Milk sugar	5.25	4.30	3.90
Salts	0.88	0.70	0.65

Under the head of density, compared with water as 1,000, milk gives the extreme figures of 1,026, to 1,036. To make it plainer, let us say that a vessel, which would hold 1,000 ounces of water, would hold, if the same bulk of milk were put into it, from 1,026 to 1,036 ounces of the latter, according to the richness of the sample.

As regards bulk, *water* is the basis of milk, and it would seem to hold enough of this without the dealers adding an excess of the basis, a thing they have the reputation of doing.

The fat is contained in milk in the form of globules. Certain chemists have asserted that these globules are enclosed in a sac or membrane, but nowadays, the conclusion seems to be that there is no such thing as this membrane. Such is the decision (*opinion formelle*) of Duclaux, professor in the faculty of science, and in the Institut Agronomique, of Paris, published in 1887.

Casein is present in milk in two forms: in suspension, and in solution.

Albumen is present in solution; but here comes this same Mr. Duclaux, declaring that all the chemists who have written before him have mistaken casein in solution for albumen. And it must be allowed that the demonstration is plausible.

Lactine or milk-sugar, is the substance that gives milk that sweet taste we all know.

Follow, the salts contained in milk:

Phosphate of lime;
" " magnesia;
" " iron;
" " soda;
Chloride of sodium;
Carbonate of do.

Of the six salts mentioned, phosphate of lime and chloride of sodium, are the two dominant ones.

Now that we know the composition of milk, let us see what is its nutritive value.

Milk dried at 230° F. contains, according to Boussingault:

Carbon	54.9
Hydrogen	8.6
Oxigen	27.9
Nitrogen	4.0
Salts	4.9

It compares with meat and eggs thus: 100 part contain of

	Albuminoids,	Fat.
Boneless meat	19.5	2.0
Eggs	12.3	1.0
Milk	4.3	3.3

Milk is called a perfect food, and it well deserves the title, for by its nitrogen it forms the tissues or muscles, its sugar aids heat and respiration, assisted in that office by the fat, which in addition composes the fatty matters of the system, while the salts serve partly to form the bones and furnish the alkaline salts of the blood, the urines, and the sweat.

Another calculation, made from the food point of view, proves that the *comparative value of milk in its different states* is as follows:

For 100 parts of pure milk, an equivalent is
300 " " " of skimmed,
450 " " " of butter-milk.

ON THE VARIATIONS AND CHANGES OF MILK

If the normal milk is on the average such as I have described, its nature is nevertheless very changeable, and this mutability often lowers or raises this average, and makes milk change its quality according to circumstances. The causes of these variations are numerous; the most common are: diversity of breeds, the age of the animals, their habits, the health of the cows, their lodgings, their food, their character as milkers, the effect of milking, time of calving, the age of the milk, ferments or microbes in milk, the place in which milk is kept: we shall proceed now to study each of these points.

The difference of race is one cause of the great difference in the quantity of milk given by each of them. The butchers' breeds, such as the Herefords, Devons, Angus, Sussex, &c., generally give but little milk. There are, however, races which though well suited for beef, still furnish good milch cows as well; the Durham or Shorthorn is one of them. Then come the dairy cows, the Ayrshires, Jerseys, Guernseys, Holsteins, Canadians, Dutch, &c. These give great quantities of milk, but thy differ from each other both as to the quantity and quality of their produce. Thus, as a general rule, the Dutch and Holstein cows give more, even very much more milk than the Jerseys and Canadians, but their milk is less rich in solids. The Ayrshires milk is rich in casein; so is the milk of the Ducth and Holsteins. The Jerseys and Canadian cows yield milk in smaller quantities, but very rich in butter. And these differences are very great. It has been known to take 35 lbs. of milk from a Holstein to make a pound of butter, while only 13lbs. of Jersey milk has made the same weight. So, you see, the variation is great.

The age of the cow has a good deal to do with the quantity and quality of the milk. No cow comes to her best as a milker, to whatever race she may belong, before her third calf. The milk-secreting organs are not fully developed before that time, and the milk produced is not so rich. When the cow attains her tenth year, both quality and quantity of milk begin to fall off.

Every change in the habits of, or in the mode of keeping cows, produces a variation in, and even a deterioration of, their milk. Thus, a cow sold by the owner as a good milker has been known to suffer a great loss of solids in her milk after changing hands. Her milk, taken from her on her arrival at her new home, when she was weary from her journey, and when she had been worried and bullied by her new companions, and another sample taken after she have rested a few day, were both analysed:

The former gave:

Solids per cent	11. 28
Of which, butter-fat	2.16

The second gave:

Solids per cent	15.08
Of which, butter-fat	5.54

Every cow that is ill-treated, frightened, disturbed in its habits of life, though it may not show such a notable variation as above, still suffers considerably in the quality of its milk.

It has been stated that cows, which are obliged to travel about a good deal in grazing, give a milk richer in cheese, but poorer in butter than those cows that are *soiled* in the cow-house.

The health of the animals is the thing that has most effect on the secretion and the quality of milk. A little further on, I shall have occasion to mention instances of diseases, of wounds that deteriorate milk in such a way that either eye or palate can detect the fault. At present, I will only speak of those cases in which milk, though still well-flavored, is infested by germs, *bacteria* or *microbes*, invisible but certain vehicles of diseases, often mortal, to those who drink it. It is now admitted by physicians that the milk of cows affected by *tuberculosis* conveys that disease to certain persons who drink it, and whose constitution is such as to be fit for the propagation of the germs of this terrible complaint. Diphtheria, scarlatina, typhoid fever are also said to be transferable to man through infected milk. (1) One observation: every time a cow that gives a large quantity of milk falls off in spite of good feeding, you may be quite sure that she is attacked by tuberculosis or, in other words, consumption.

As a general rule, if a cow is unwell, her milk immediately becomes deteriorated. The same thing occurs when she is seeking the bull.

The lodgings (milieu) of the animals have great effect on the changes undergone by milk. I spoke in the last paragraph of the germs of certain diseases that are communicated to man through milk. Now, some of these germs may exist in a cow's milk without her being ill. They are communicated *to the milk by external causes, which do not effect the cow.* Thus, decomposing materials, mixens too near the cow-house, putrid puddles of water, are so many sources of infecting germs which attack the milk, and thus make it the means of propagating many complaints, such as diarrhœa, cholera infantum, &c, &c.

In the Western States, there is a special complaint called the *milk-disease* which is caused by *bacteria* which the milk contains. This disease is often very serious, and as it does not always rage in the same places, one is free to believe that the cows, or the milk, receive these germs from the medium in which they live, from the plants, from the soil, or from the air.

(1) If the milking is done by a person who has not completely recovered from the malady in question. A. R. J. F.

We know, too, that cows kept in stables too low for them, too hot, unventilated, where the manure is seldom carted away, yield milk with a well-developed flavour of manure, however cleanly may be the actual performance of milking.

The food of milch-cows is probably the thing that has the greatest influence on the condition and composition of their milk: we know that everything that has a strong and characteristic odour, good or bad, communicates that odour to the milk, as soon as the cow has eaten it. In the class of the substances that give a bad flavour to the milk are onions, garlic, mustard, turnips, rotten oilcake; grains (*brewers'*) that have heated or become mildewed, sea-weed, too many potatoes as food. (1) On the other hand, the tender succulent grass of spring gives an exquisite aroma to the milk. The *drea* of the distillery produces thin and watery milk. The grass of a farm irrigated with drainage from a town has been known to produce milk that became putrid in twelve hours. Green-meat, *tares*,&c. give plenty of milk of poor quality, as(2) do wet food, slops, &. Poor pastures give poor milk; plentiful but coarse pastures yield inferior milk.

As I said just now, potatoes, which increase the secretion of milk, if they are given too profusely, make the milk taste like rotten eggs—sulphuretted hydrogen.—Pumpkins, if too much of their seed be given, act, by the effect of the latter as a diuretic, and, while increasing the quantity of milk impoverish it.

Rich, dry fodder diminishes the quantity but augments the richness of the milk.

As we shall see, some other substances colour the milk. Here is a list of plants which exert an action of some sort or another on milk: sponge-wort, hyssop, hemlock, wormwood, sow-thistle, chicory, mare's-tail, butter-wort, sainfoin, bugloss, cleavers, marigold, pea-pods, St. John's-wort, and sedge. These have not always an inevitable effect, but, under certain special circumstances, they cause a deterioration of the milk which they alone are capable of effecting.

Other plants, such as the nettle, which yellows the butter, spurrey, which makes the milk rich in butter, cow cheat (*malampyre*) which gives it a good flavour, have only a good effect on milk. In the article on the accidents that occur to milk we shall see what are the effects caused by each of the other plants above named.

Lastly, certain-plants or substances diminish the secretion of milk without deterioration of quality: tares (*the seed of*,) mare's-tail, sedge, oak leaves, knot-grass.

The fitness (aptitude) of each cow for her proper business as a milk producer exercises an unconquerable power over the milk-secretion of that cow. Every one knows that there are good and bad milkers. Let us take one of each sort and put them both on the same keep. However good the keep may be, the good milker will always give more milk than the bad one. However bad the keep may be, the cows will both fall off in their yield, but the good one will still give more than the bad one. It is therefore a wrong idea to believe that good food will convert a bad milker into a good one. The former will get fat, that is all. And this is true not only of the good and bad races of milch cows, but also of the good and bad cows of the same race. The conclusion to be drawn from these data is: send every naturally bad milker to the butcher.

Milking, as regards the manner in which it is done, the time at which it is practised and its frequency, has much to do with the secretion of milk. As to the manner, it should be done gently, regularly, with cleanliness. A cow, milked roughly, keeps back her milk; milked irregularly, she soon dries up; milked without cleanliness being attended to, she gives dirty, impure, ill-tasted milk. As to time, milking ought to be done at regular hours, morning and evening, and it is stated that a third or noon-milking, particularly in the case of a young cow, is likely to increase the flow of milk, and, if we are to trust certain experimentalists, its richness as well.

(1) *Boiled* potatoes excepted. A. R. J. F.

(2) Tares or vetches are said to give *ropy* milk. If they are given to cows in an immature state they will produce poor milk, not so, when in full bloom. A. R. J. F.

I will mention one fact, before leaving this subject, a fact too well known to certain patrons of creameries, who retain for their own use the stripping (*égouts*) of their cows; this is the fact: the last-drawn milk is the richest in butter. The truth of this is undeniable Differences as great as the following have been noted:

First drawn milk.	Last drawn milk.
Solids, 9. 62;	Solids, 19 07;
of which butter, 1.2	of which butter, 11.02

(Reiset.)

- —

The time since calving has an influence on milk. A cow, according to the average of many experiments, that gives 1020 quarts of milk in 9½ months, the first fortnight after calving being omitted, on account of the presumed presence of *colostrum*, would secrete milk in the following proportions:

10 quarts	a day	for the	1st and 2nd months.
8	"	"	3rd, 4th and 5th months.
6	"	"	6th and 7th months.
4	"	"	8th month.
3	"	"	9th month and 10 days.

As we get further from the time of calving, the milk diminishes in quantity, but becomes richer. According to Heuzé:

At 2	months from calving	milk gives	1 oz.	of butter	from 2lbs;
At 4	"	"	1¼ oz.	"	"
At 8	"	"	1½ oz.	"	"

If the milking period be prolonged nearly up the time of calving, the milk is often found to be bitter or salt. (1)

It has been found that butter from a cow 6 months gone with calf is always inferior to that from a cow that is barren or that has only been lately served, and these facts are explained by the fœtus requiring a part of the cows food for its own support.

Lastly, the calving has this additional influence on the secretion of milk, in the sense that no cow comes to her best as a milker until she drops her third calf.

The age of the milk, that is, the time elapsed since it was drawn from the udder, brings about important changes in its condition. The moment it leaves the cow, the milk, acted upon by the air, begins to work. The fat rises to the surface, the sugar ferments in the milk and makes it acid, and the casein coagulates and forms itself into a mass in the whey. To gain this coagulation more rapidly when cheese is made, rennet is used, but this only quickens the coagulation which would be sooner or later produced without its aid. In fact, milk, according to M. Duclaux, contains microbes, some of which are named aërobes, because they need the action of the air for their development, and other, anaërobes, because they can do without the aid of the air; the whole group bearing the generic appellation of Tyrotrix, 7 of which are aërobes and 3 anaërobes. These microbes attack milk immediately it is exposed to the air, developing a sort of ferment differing from the ordinary rennet, but, like it, producing coagulation.

(1) A cow should have about six weeks rest before calving. Too many *habitans* dry off their cows in November and thus lose the chance of selling butter at the highest price of the year. A. J. J. F.

These microbes develop themselves also in broth, or in a solution of gelatine. Other chemists call the agent that causes acetification by its action on milk-sugar, *bacterium lactis.* (1)

The transformations which milk undergoes, to whatever agent or microbe they are due, are 1, the rising or separation of the fat in the form of cream; 2, acidulation; and 3, coagulation. It is these phenomena which are taken advantage of in the making of butter and cheese.

The situation (milieu) in which milk is placed is the cause of many of the transformations it undergoes. Manure, rags, putrescent water convey a bad taste and smell to milk, even after it is drawn from the udder. This explains why milk which in winter, is always kept in close rooms where plenty of bad smells are present, for want of ventilation, produces butter of inferior quality.

Badly washed vessels, foul utensils, dirty clothes worn by the dairy-people, shoes soaked in stinking oil, tobacco-smoke, all these are sources of infection for milk within their reach and for the butter made from it.

MISCHANCES THAT MAY HAPPEN TO MILK

Now that we have investigated the diverse causes of the variation and deterioration of milk, we will consider what are the mischances to which it is subject, that is, under what forms its deteriorations manifest themselves. In the practical pursuit of the dairy-industry, we meet with poisoned milk, poor, watery milk, bitter and salt milk, milk tasting of rotten eggs, milk that sours or coagulates as it leaves the udder, purgative milk, viscous milk, milk that will not coagulate, milk, the butter of which will not "come", milk that curdles in heating, blue, red, yellow, and green milk. Let us attend for a moment to each of these accidents:

Poisoned milk is that which contains the germs of tuberculosis, or apthous fever. Milk kept in zinc or copper vessels may become poisoned, if it sours. The milk of cows that have eaten hemlock or hyssop at pasture has been found to become poisonous.

Lastly, professor Vaughan, of the University of Michigan, asserts that he has discovered in cream, in ice-cream, and in milk, an eminently poisonous principle which he has named *tyrotoxicon*, which seems to claim some alliance with M. Duclaux's Tyrothrix, (2) The development of this poison must be caused by want of attention to cleanliness.

All milk suspected of containing the germs of disease should be boiled; if it cannot be thrown away!

Poor, watery milk, of a bluish white containing but little cream; this is due to the long-weakened constitution of the cow, or to too dilute a ration. Heifers and cows suffering from indigestion too often give milk of this kind. Cows which drip milk, or in other words, suffer from *galactorrhœa* often give poor milk like this. (3)

Bitter milk is produced by badly kept cows, which eat spoilt fodder, drink putrid water, are ready to calve, have eaten nothing but oat straw for a long time, or are suffering from bilious fever. The leaves of trees in autumn, worm-wood, St. John's wort, and chicory, eaten by cows, will cause their milk to be bitter.

Salt milk comes from two different causes. It may be from the nearness to calving of the cow, or from her eating seaweed.

Milk with the taste or smell of rotten eggs is yielded by cows fed entirely on potatoes. (4) Thes tubers develop sulphuretted hydrogen, the characteristic odour of which is well known to all who have broken the shell of a boiled egg, supposed to be fresh, but which, instead of being so, is far on the road to produce a chicken.

Milk that turns sours or coagulates as soon as it leaves the udder almost invariably points to inflammation of that organ, to indigestion or the presence of fever in the cow that has given the milk. Being raced about, a sunstroke, the approch of a thunder-storm, milking too long deferred, the eating of bitter-wort at pasture; all these are causes of this accident. If it shows itself as soon as the milk is in the pans, it may be due to these vessels being made of wood, or to the vessels in general not having been kept clean, and perhaps having sour milk in them.

Purgative milk, if closely examined, will frequently show traces of colostrum. That is as much as to say, you have begun to use it after calving before it was fit. Spurge-wort and hyssop, eaten by cows, are said to impart this effect to milk.

Viscous milk, having about the same consistency as linseed drink (*tisane*), appears to be the product of a *fungus* called *Oïdium lactis*, which inhabits cow-dung chiefly. It is always present in milk that is exposed to the air, but is, generally, innoxious. When the air is damp and warm, it develops itself freely, particularly if there is much cow-dung about. It is quite distinct, according to Rees, from the *penicilium*, the *mucor*, which are ordinary forms of mildew. The diarrhœa in calves, and in infants that drink nothing but milk, is ascribed to this fungus.

Viscous milk is sometimes caused, too, by indigestion. Butter made from it is usually little abundant, oily and of bad flavour. It is often found in the case of cows bulling and not served for some time, and, lastly, it is attributed to too rich food during hot weather, to the presence among the grass of St. John's wort, lobelia, spurge-wort, and tansey.

Milk that will not curdle is pretty seldom met with. Still it is a mischance that has happened, and it is said to be due to the cows eating lots of green pea-shells or mint.

Milk the butter of which will not "come" without great trouble is common, especially in autumn and winter. There is nothing determined as to the cause of this mischance. Some attribute it to a disease of the udder, to the absence of acids in the milk, to the giving of salt in the food. The milk of cows that have not had a calf in the season, or of those which are on the point of calving, are subject to it. Others say it is due to letting the milk stand too long before skimming, churning below 60° F., letting the cows drink foul water, or racing them about. Generally a little vinegar or sour cream is added to the cream to entice (*provoquer*) the butter to come. Others advise freezing the cream and afterwards raising it to 60° F. before churning.

Grumous or clotty (1) *milk* is, it appears, a certain sign of the malady called the *cocotte*, or apthous fever, among the cows that yield it.

Milk coagulating when boiled may indicate four distinct things. It may be old milk, or colostrum used too soon after calving; what is called *urouille* in France, and *vriou* here, (*vriou* no doubt is a corruption of *urouille*,) or it may be milk given by cows suffering from aphthous fever, or, lastly, milk from a cow attacked by *mammitis* or disease of the udder.

Blue milk, which must not be confounded with the poor watery milk spoken of above, presents a singular appearance. When drawn, it seems all right, but, after from 24 to 48 hours, it is covered with blue spots, which increase in size until they cover the entire surface. Fuchs attributes this to the presence of a vibrio, *vibris cyanogenus*, and others to a mildew.

(1) *Tyrothrix=cheese hair. Bacterium*=a stick, and the creature, microscopic of course, is very like an infinitesimally small stick. A. R. J. F.

(2) *Tyrotoxicon=cheese-poison.* A. R. J. F.

(3) *Galactorrhœa=milk-gleet.* Trans.

(4) i. e. on *raw* potatoes. A. R. J. F.

(1) *Clotty* milk must not be confounded with the *clotted* cream of Devon and Cornwall; "which is an excellent thing." A. R. J. F.

It appears more frequently in great heat with a damp air, and in thundery weather. Its occurrence is also laid to the charge of the grass eaten by the cows, containing mare's-tail, bugloss, sainfoin, knot-grass, which herbs do not always produce blue milk, only when the cows have a predisposition of special direction.

Its appearance is prevented, or it is arrested if in progress, by giving the cow salt; with some acid, as vinegar, butter-milk, &c., added to the milk. The dairy should, it is said, be fumigated with sulphur.

Red milk appears in two forms, sometimes it is blood-red, at other times the red is of a different shade. If the former, the red deposit will be found on the bottom of the pan; if the latter, on the surface of the milk. Bloody milk comes from an inflamed udder, from milking done harshly, from blows from branches, from the cows having been raced about by dogs or boys. The other form of red-milk is due to cows eating certain plants such as the anemone, the ranunculus, the spurge-wort, together with the buds of the pine, the elm or the poplar, and cleavers. Too good condition of the cows and a too copious exhibition of cotton-seed-cake are said to cause this bad effect.

Yellow-milk is said by Fuchs to be due to the presence of the *vibrio xanthogenus*, which colours the milk like the yolk of an egg. Others say it comes from aphthous fever, or congestion of the udder. The presence of *cheat-cow*, or *souci des marais*, in the pasture may have something to do with it.

Green-milk, which is rarely met with, must of course be the production of a vibrion, probably of the *vibrio chlorogenus*, if there happens to be such a beast! (1)

My task is ended, gentlemen, but before leaving I should like to say that I am only a compiler, an humble fellow-worker with the French, English, and American chemists, whose names are, no doubt, known to you all. Many years have they been working to elucidate the obscurer paths of science, for the benefit of their contemporaries and of future generations. Not being able to emulate their progress in the noble path they have chosen, I devote myself to the humble office of spreading abroad that light which we owe to their labors.

(1) *Cyano*=blue; *xanthos*=yellow, *chloros*=green.
A. R. J. F.

CHEESE-MAKING.

LECTURE BY D. M. MCPHERSON, OF LANCASTER, ONT.

In this country, cheese is made principally from the milk of the cow; before we can succeed in making good cheese, we must know of what this milk and this cheese are composed, and what are their qualities.

Cheese, a solid substance, is extracted from milk, a liquid substance. In making cheese, only one thing is added to the milk, rennet, and only one thing is taken away, whey. The quality of the cheese is chiefly determined by this addition of the rennet, and by this removing of the whey.

But before attacking the question of cheese-making, allow me to say that the production of the milk has more influence on the quantity and quality of the cheese than farmers and makers generally believe. I will go so far as to say that the *making* of the cheese is only one end of the cheese-industry. In order to make sure of all the conditions of success, we must not stop at the management of the milk in the vat, but go back as far as to the very food the milch-cow receives.

First, our cows must be well looked after, must receive appropriate food, if they are to produce good milk and plenty of it. Then, this milk must be suitably treated, if the cheese produced from it is to be uniformly plentiful in quantity and good in quality; for it is on these two conditions, quantity and quality, that success in farming depends.

To get plenty of milk from your herd you must, in the first place, feed the soil or the plants. The produce thus extracted from the land may be used either directly, by selling grain and hay, or indirectly, by turning the grain, hay, and straw into food for animals, to make them yield either meat or milk, or those articles manufactured from the milk. The first principle then is to feed the plant so as to arrive at feeding the animal.

The second principle is to feed the animal so as to arrive at feeding the plant. This is the grand point that should be studied by all farmers. All of you are feeding your cattle this winter for the purpose of being able to feed your plants next summer. If you waste your manure, if you allow it to run down the ditches, sink into the wells, generating malaria, the doctor and the undertaker will be the only ones who will benefit. For this manure, which, neglected, develops fevers and often causes death, becomes, if taken care of, the food of the plant, and, in its turn, the plant becomes the food of man and of beast.

Now, in order that farming may be profitable, we must make the consumption of a cheap food produce a thing that will sell for a high price. Wheat, barley, oats, are costly foods; on the contrary, bran, clover-hay, linseed, cotton-seed, are cheap foods. (1) It pays, therefore, to sell grain and buy these cheap-foods. Manufacture only answer on the condition of buying raw-materials cheap, which we subsequently convert into articles of high value. Well, farmers are manufacturers; they must buy cheap and sell dear. I know some of them who sell hay in the fall for 8 and 9 dollars a ton, and, in spring, buy again for 11 and 12 dollars to feed their cattle on it. I know some of them who sell their grain in autumn, and, in spring, pay 50 % more for seed-grain. That is selling cheap and buying dear.

The food of animals gives two profits: profit direct, the production of milk or meat; indirect profit, the production of manure, plant-food. We must know then how to feed the animal for the plant, and the plant for the animal. Learned men tell us that plants of a vigorous, robust habit, contain more nourishment than plants of feeble growth. So, an animal full of life and strength is more profitable to feed than a delicate one.

All that a beast yields comes from the food it receives and all that a plant contains comes from what the soil has received from you or from nature. Consequently, we must learn how to feed both soil and plant, for the animal's sake, and to feed the animal so as to have a right to expect good results: the production of milk and meat.

Part of the food the beast eats is converted into heat. The animal heat must be kept up, at any cost, in every part of the body, else the beast will lose weight. The system must be maintained at 98° F.

The production of milk is in a great measure determined by the quality of the food. The best food, in my opinion, is clover-hay and mixed grasses. Farmers in general do not appreciate clover. Clover is good; you cannot sow too much of it. (2) It has all the elements necessary for the support of beasts; it is at the same time a meat-former and a purveyor of heat.

Bran is another good food: I prefer the modern *roller-bran* to the old process or *brown-bran*. Bran contains phos-

(1) Yes; and I wish this was more generally felt. We go far too much on the idea that a farm should produce every thing that is consumed on it, whether it is fitted to the purpose or not. A. R. J. F.

(2) If you repeat clover too often on the same land, you will find that it will refuse to grow at all. A. R. J. F.

phates, and other elements entering into the formation of the bones and muscles.

Cotton seed is a good food for milk-making. It contains an excess of albuminoids, and is one of the best things to mix with straw, hay, ensilage, &c.

Linseed meal is good, too, but better suited to feed calves than for milk-making. (1)

Now, the quality of the water drunk by the cow influences greatly the quantity and quality of the milk she gives. No beast ought to drink dirty, muddy water; water that the farmer himself would not drink. If farmers would learn this truth, and act accordingly, it would be a great step towards the manufacture of a better article than we make to-day. Two motives should induce us to give our cattle nothing but pure water to drink: the preservation of their health, and the production of a good article for sale.

When the milk has once been produced, if good cheese is our object, two conditions must be realised before its delivery at the factory: the milking must be conducted with the greatest cleanliness, in proper vessels, well washed in boiling water, and the milk must be strained and aërated. It is better to strain twice than once, three times than twice, and four times than thrice. A strainer, made of several folds of calico, is the best.

The aëration of the milk acts upon the milk-sugar and and forms an acid from it. This acid thus developed in the milk will act in concert with the rennet in causing the coagulation of the curd and helping it to retain the butter-fat. Without aëration, no man can make good cheese.

This aëration can be done with the dipper, or by passing the milk over some metallic surface. In general, this question of aëration is not understood by farmers; they do not pay enough attention to it.

The cheeseman must, every day, look at the state of the milk he receives, attend to the temperature of the past night, and the temperature of the milk and of the morning, before he determines how he is to set to work. If the milk, from the low temperature of the past night, comes to the factory in too sweet a state, he has to keep it in the vat for some time, warming it up to 82°, 85°, and even to 88° F., and stirring it to acetify it by the heat. This will help the rennet to act powerfully on the curd, and will aid in retaining the cream in it, giving that fine flavor so highly prized by the trade.

The rennet ought to be used in sufficient quantity to bring the curd in 15 minutes in spring, and 20 minutes in summer. The curd ought to be ready to cut in from 40 to 45 minutes in spring, and from 55 to 60 or even 70 minutes in summer.

The rennet should be dissolved in a pail of water for each vat of milk, properly mixed, poured into the milk, and well stirred for 5 minutes, gradually slackening the pace of the stirring.

After 7 or 8 minutes, perfect repose. The vat must be covered, to keep the temperature uniform.

When the curd is firm enough, which may be known by its breaking clean under the finger, it is to be cut in pieces, taking great care to slice the pieces of equal size.

Then, the curd is to be stirred gently for 10 or 15 minutes. This is done to make a crust (*écorce*) form on the curd.

The heating is commenced 5 minutes after the stirring, if the milk was ripe: 10 or 15 minutes, if it was sweet

The rennet was added at 84°; the heating should be carried up to 98°. If a softer cheese is wanted, in spring, the heat should not exceed 96° to 97°. But for a young hand, it is better always to go as high as 98°. This heat should be kept up all the time as much as possible; when acidity begins to show itself, with the hot iron-test, is the time to draw off the whey. The difficult point in cheese-making is to preserve all the slices of curd that remain in the vat at the same temperature. To allow any part to cool is to spoil the flavor and color of the cheese.

When the whey has been drawn off and the curd is dry, it is worked over with the hand, so as to break all the lumps that may be found in it. Thus working, a uniform curd is produced, equally firm in all its parts. This is the great secret of all.

Next, the curd is piled, heaped up in the vat, and allowed to remain in that state for 3 or 4 hours, to undergo the action of the rennet; it should be turned from time to time. After 3 or 4 hours the temperature of the curd should have fallen from 96° to 90°. It is allowed to cool thus that the cream may be retained in the curd while the latter is being ground in the mill. More cream is retained by this treatment. Sent hot through the mill, the curd breaks, and there is more loss.

A full half-hour after grinding, the cheese is salted with 2 lbs. in spring, 2½ in summer, 3 and even 3½ in autumn. (1)

Half an hour after, the cheese is put into the moulds, which are left upright in the press, and well covered; it ought not to be pressed for more than a quarter of an hour, or a little longer, after it has been put into the mould. This precaution prevents loss, and the whey will run off more clear.

A quarter or half an hour after, you may gradually increase the pressure. For two or three hours, the pressure should be moderate. One reason why cheese, and the moulds too, are sometimes burst, is that too heavy a pressure is applied at first.

The cheese ought to be turned in the evening, and again in the morning; this makes the cheese firmer and better. If some cheeses are out of shape, by turning them in the morning, that fault will be corrected, and the form of your cheese will be pleasant to the eye.

Great care must be bestowed on the cheese from the time it leaves the mould till it is put into boxes, so that the work of the maker may not, on an outside view, have the appearance of having been badly conducted.

Now, let us look at the question of cheese with *eyes* or holes in it.—These *eyes* are caused by gases which are developed in the cheese, after pressing, in the cheese-room. They are obviated by letting the curd remain rather longer betwe n the draining off of the whey and the grinding. Instead of 3 or 4 hours 4 or 5 hours ought to intervene between these two operations.

Open cheese (*fromage ouvert*) is caused by the cows drinking bad water, or by the exposure of the milk in the neighborhood of the cowhouse or of pigsties. Sometimes it comes from bad food given to the cows.

DISCUSSION.

The Abbé Montminy.—Would Mr. McPherson kindly show us how to color cheese uniformly?

Mr. McPherson.—The reason why cheese often looks badly colored is that sufficient care is not taken to have *in the vat* curd equally solid all through, and of *regular, equal-sized pieces*. Hence, there are in the curd pieces that are soft, from being too moist, and hard pieces, from being too

(1) I cannot agree with this, unless the meal from ground cake is intended. Crushed linseed is, according to my experience, the best of foods for producing rich milk and at the same time keeping the cows in perfect health. A. R. J. F.

(1) *per cent.* of course.

dry. When the curd is cut of unequal sizes. this always happens; the larger pieces retain more water, more whey, than the smaller ones, and, in consequence, are softer; just so is it with the pieces that have been kept less hot than the rest. And what follows is this; the softer parts become acid, are dissolved, and ruin the color by some chemical action. If the curd be uniform, the color will be uniform. Hence, the importance of cutting the curd very equally, of always having the temperature well under command, and of maintaining it equal over the whole of the curd.

A voice.—What temperature ought to be kept in the cheese room?

Mr. McPherson.—Seventy degrees. It is a mistake to think that a defect in the color of cheese is due to the color ing matter. This is usually well made; but the fault is generally in the maker, and not in the color. Every one knows that cheese become sour, becomes also white; this proves that the cause of the decolorisation of cheese is—acidity. And apropos to this point, I must tell you that it is a very bad plan to keep curd from one day to the next; this ought never to be done. Far better make it into small cheeses and keep them for the patrons.

M. Paul Côté.—Would Mr. McPherson repeat what he said about the temperature, the putting the rennet into the milk, &c.

Mr. McPherson.—As to the rennet, the heat is the same at all seasons—84° F. The milk, in spring, ought *to take* ten or fifteen minutes after the rennet is added, and be fit to cut 40 or 45 minutes afterwards. In summer, with *sweet* milk, rennet should be added so that the milk may begin to curdle in 20 minutes, and be fit to cut in 60 or 70 minutes.

A voice.—Why should milk coagulate sooner in spring than in summer?

Mr. McPherson.—In spring, on account of the fresh, cool state of the air which then obtains, milk wants a great deal of rennet to hasten its ripening. If the quantity of rennet is not increased, the cheese would take too long to ripen.

Hon. J. J. Ross.—Must cheese necessarily be colored?

Mr. McPherson.—Some markets ask for colored, others for white cheese. Each must be guided by his own judgment; and the same for the best time to sell. If you think colored cheese will pay best, color it; if not, do not color it. Colored cheese is not in such request as formerly; white has the call over it. There are only a few markets, such as London, Liverpool and Glasgow, that seek for colored cheese. Bristol and Manchester take white.

M. Chapais—What do you think of the effect of ensilage on milk?

Mr. McPherson.—I hold ensilage, properly used, to be a good food. It is not a complete ration; it wants, as a complement, a flesh-former, being itself a heat-producer. Clover-hay and bran are foods fit to supply the defects of ensilage.

A milch-cow requires one part of flesh-forming food and five parts of heat-producers; or, if you like it better put in this way. 1½ lb. of flesh-formers and 12 to 14 lbs. of heat-producers. Corn produces only heat; it contains only one part of flesh-formers against 12 of heat.

Wheat-bran contains 1 lb. of flesh-formers to 4½ lbs. of heat-producers. Therefore it must be a good aid to ensilage.

Timothy-hay has about the same proportions as ensilage: one of flesh to twelve of heat.

Clover-hay in itself is much more perfect. It holds one of flesh to six of heat; it is a perfectly balanced ration in itself.

Cotton-seed is excessively rich in flesh-formers. It contains 1 of flesh to 1½ of heat. This seed, in cake or in meal, should be used especially as a complement of those foods in which the heat-producers predominate.

Of bran 4 lbs., 5 lbs. of cotton-seed, and from 60 to 70 lbs. of ensilage appear to me to form a perfectly well-balanced ration; and, at the same time, it is the least costly mixture to be found. These different foods all balance one another, they are well assimilated by the animal, and they form an excellent ration for the production of milk.

Clover-hay and ensilage together make an excellent mixture.

M. Dion.—Has ensilage any effect on the quality of the milk?

Mr. McPherson.—Personally, I have no experience on this point, but I was at the Vermont Dairymen's meeting, at Burlington, last week, where I met several butter-makers who fed their cows on ensilage, and who got 75 cents a pound for their butter in Boston. Mr. Dawes, too, of Lachine, furnishes the Windsor Hotel, at Montreal, with cream at a dollar a gallon, and his cows are ensilage fed. But, as I said before, ensilage, must not be given alone, but with grain, bran, or clover-hay.

Many thanks, gentlemen, for the attention with which you have listened to me. I am happy to have been amongst you here to day, and I hope the few remarks I have made will be of service to you. What I have told you is founded on practice; it is what I have done myself successfully; and you can all put it in practice without fear of the results.

M. Taché.—Last year, at the invitation of the Dairymen's Association, Mr. McPherson paid two gratuitous visits: one to St. Hyacinthe; the other to Montmagny. M. l'abbé Gérin, whose district has not yet had the advantage of receiving a visit from Mr. McPherson, has begged me to ask him to visit the North next spring. Mr. McPherson accepts M. Gérin's invitation with pleasure, and will go to Louiseville, to give a lesson to the cheesemen who will meet there on some day to be announced beforehand.

The Association is indebted to Mr. McPherson, and thanks him for the kindness with which he has always granted it the services of his vast experience.

The best use of Clover.

In this country—or at least in the older States—clover is the chief crop upon which the farmer relies for improving or maintaining the fertility of his land. Other crops are sometimes substituted, but never with such good effect as clover. There are many ways, however, in making use of clover as an improver of the soil which are attended with different degrees of benefit. And while much depends on the locality, distance from market, &c., there are certain principles which are alike applicable to all cases. The roots of clover are the most important part of the plant, so far as the improvement of the land is concerned; not that the tops are any the less valuable, but that there are many other plants which for bulk and quick growth above ground may be said to excel it, but which when turned under with the view of improving the land are far less beneficial in their effects. Buckwheat, for instance, has a much more rampant growth of top, but the effects of this when turned under are not near as good as those of clover. And why? Simply for the reason that buckwheat and such annuals as it, do not penetrate the subsoil and bring up therefrom and deposit near the surface the mineral matter contained therein, and which is so essential to the successful growth of plants, their growth being due only to what the roots took from the ordinary surface soil. In other words, the roots of the clover plant bring up fertilising matter from the deeper subsoil, which the roots of buckwheat and such other annual plants cannot reach. Clover should never be turned under until it has attained its largest growth, as well below as above ground, says a Baltimore daily paper. For this reason the old practice of plowing it under when in bloom is objectionable, for, although the growth of stem and leaf is then at its maximum, the roots have very little more than begun their growth. But by cutting the first crop, a second growth is the sooner induced, which, although much less in amount, secures an enormous increase in the growth of the roots, thereby placing it in the best condition for turning under. The best way, then, to secure the full benefit of clover in the improvement of the soil is to allow it two full seasons of growth before turning under, for, as the plant is properly a triennial, more or less of the roots die out at the end of the second year, thus causing the weeds to spring up and take their place, leaving the after condition of the field as a damaging offset to any good effected by the clovering. But when the first of the second year's crop is taken off, the second starts so soon and makes so strong a growth as to completely smother the weeds. Says Dr. Voelcker, England's most noted agricultural chemist.—" I find that a clover sod is the most valuable as a fertilizer after it has been used for two seasons for hay, as the roots have then attained their full development and are richest in fertilizing elements." What, therefore, the farmer who wishes to avail himself to the full advantage of this crop had best do, would be to turn the sod under when full of roots, preparatory to putting the land in corn and wheat, or corn, oats and wheat, as the case may be, and then seed down to clover again. Cut the clover two years for hay (or pasture it, which is pretty much the same thing), and then plow under the sod as before, and so on, turning under good clover sod every three or four years until the land is completely renovated, applying at the same time whatever barnyard manure you can spare to help hasten the process.

Farmer's Review.

Heated Hay-mows.

I notice an article on this subject in the *Watchman* which says, " Hay that has been heated in the mow not only parts with quite a portion of its nutritive properties, but becomes unwholesome for stock of any kinds." I question the accuracy of the first part of this statement, and know the last part is not in accord with fact. Last year I cut a part of my hay quite early and got it in without drying as much as farmers used to dry hay. I thought it was cured enough, and packed it in the bottom of the bay about ten feet deep. I did not put any more on top of it for several days and it heated very much. It smelled pretty strong, and I did not know but it was going to spoil. But I saw an article in the *Rural New-Yorker*, quoted from the *New England Farmer*, which said heating was a curative process, and that heating hay should be trodden down as solidly as possible. So I trod it down several times and awaited the result. In the winter I cut the hay down, feeding one side of the bay, and I never saw fresher, greener looking hay, nor fed hay to cattle that spent better or that cows ate with greater relish. The difference in color between the early-cut hay that heated and the later-cut hay that did not heat could be plainly seen where it was cut down. I suspect that if I had pitched that hay out when it was heating, it would have spoiled. Now if heated hay " parts with quite a portion of its nutritive properties," chemical analysis ought to show it. But does it? If so, how much and what part of the hay is lost in heating?

J. W. NEWTON.

DOWNTON COLLEGE OF AGRICULTURE RAM-LAMB SALE AND LETTING.—This sale was held on Thursday, the 8th August at the College of Agriculture. The prevalence of harvest operations interfered somewhat with the largeness of the attendance, but there was a good assemblage of buyers, and the prices were satisfactory and considerably in excess of those realised last year. Mr. Rawlence, of Salisbury, officiated at the rostrum, and spoke of the rapid progress of the Downton flock and the excellence of the lambs before him. The sale commenced with the letting of ten exceedingly well grown lambs, many of which were estimated to weigh over 25 lb. per quarter carcase weight, and exhibited splendid style and quality. Lot 1 was let to Mr. C. Cole for 32 gs.; No. 2, for 11 gs., to Mr. C. Waters, No. 3, for 44 gs., to Mr. Dibbin, Nos. 4 and 5, for 12 gs.; No. 8, for 20.; and none realised less than 9 gs. for the season. The lambs sold were knocked down at prices ranging from 5 gs. up to 16 gs. The satisfactory average of £10 a head over all sold and let was realised. Professor Wrightson and his excellent colleague, Mr. Silas Taunton, are to be congratulated on the success of the sale, and the rapid progress of the college flock in public estimation. It is worthy of notice, with regard to the *Hampshire Down* sheep, that it is essentially a tenant farmer's breed. The high prices given at this and other sales are given by farmers, and as yet the breed is not prominent among those selected by foreign buyers. We are, however, convinced that this is a rising breed, and the phrase, " The Coming Sheep," which was applied to it a few years ago, we believe by Professor Wrightson, is still as forcible as ever.

NON-OFFICIAL PART.
