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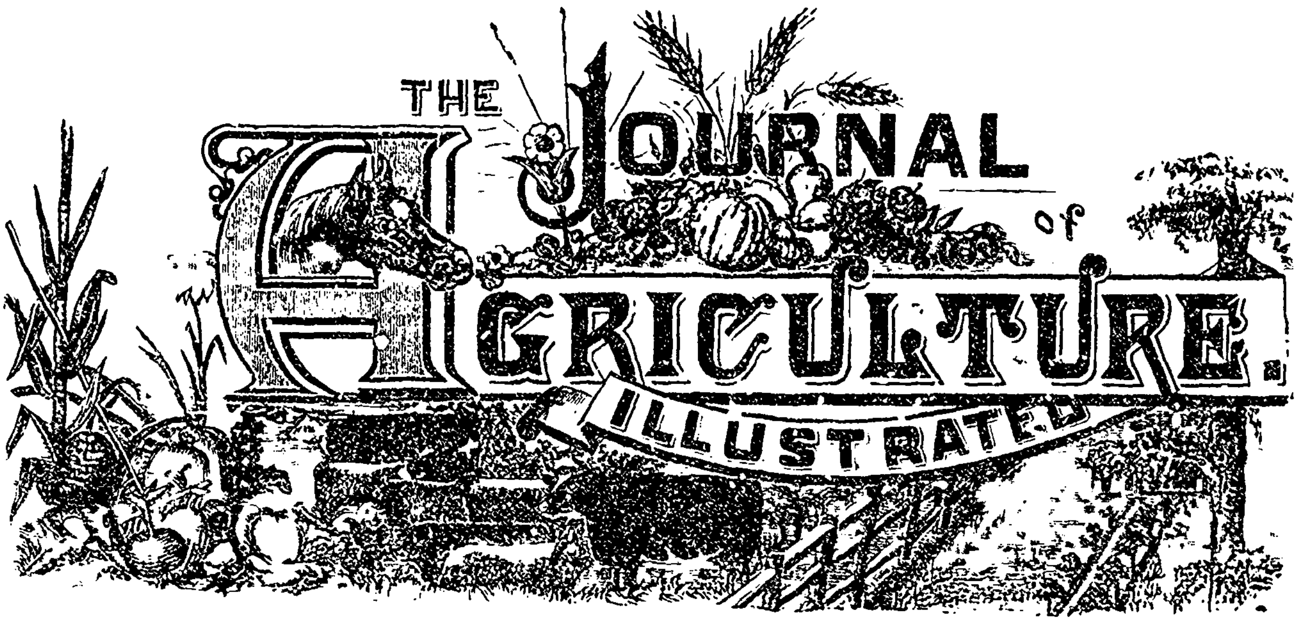

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NOTICE.—The subscription to the *Illustrated Journal of Agriculture*, for members of Agricultural and Horticultural Societies, as well as of Farmers Clubs, in the province of Quebec, is 30c annually, provided such subscription be forwarded through the secretaries of such societies.—EDITORIAL MATTER. All editorial matter should be addressed to A. R. Jenner Fust, No. 4 Lincoln Avenue, Dorchester Street West, Montreal—or to Ed. A. Barnard, Director of the *Journals of Agriculture*, &c., Quebec.

OFFICIAL PART.

Table of Contents.

Notice.—Gratuitous distribution of plans of barn-byres, and of pamphlets on drainage.

The Hon. L. Beaubien, Commissioner of Agriculture and Colonisation, requests us to inform our readers that, by addressing the Secretary of the Department, plans of barn-byres and pamphlets on drainage may be obtained gratuitously.

Notice.—Herd-books.

Dr. Couture, 49 rue des Jardins, Québec, is the secretary of the herd-books and stud book of Canadian cattle and horses, and of the swine and sheep registers recently opened by the Council of agriculture.

In future, all requests for registry in the above books as well as all letters, documents, &c., connected with them, should be addressed to him.

All letters requiring an answer must contain a 3-cent stamp.

ED. A. BARNARD,
Sec. Coun. Agriculture,
Director of the *Journals of Agriculture*.

Agricultural Clubs.—Important Notice.

The agricultural clubs already in existence and those shortly to be instituted, are requested to apply to the secretary of the Department of agriculture, who will forward to them, gratuitously, for the use of their members, certain pamphlets on agriculture, and all the information on that subject that the department is able to afford them.

H. G. JOLY DE LOTBINIÈRE,
Pres. Council of Agriculture.

DE OMNIBUS REBUS.

August 5th, 1892.

According to all accounts, the harvest of this year is going to turn out a very large amount of food for man and beast. The hay-crop is, I hear, a wonderful one, the rain of the spring having caused both top and bottom grass to grow profusely, and the fine weather since July 12th must have lessened the cost of getting it in considerably. There have always been nice little breezes accompanying the hot sun of the 'haysel,' so that the usual burning up of the hay could not have taken place this season where ordinary care was taken to ted and cock it. Nine-tenths of the inferior hay brought to market in our towns has been spoiled by letting it lie exposed to the burning rays of the sun until it was raked up into win-rows and carried. Hay made like this will not make cows give much milk. Timothy is not milk hay at its best, and when allowed, as it usually is, to stand till the seed is formed and then mown and carried, without being even once turned, it is as 'feckless' a food as dried leaves.

A writer on agriculture in the Montreal *Witness*, whose communication will be found below, very sensibly observes that " hay should be cured, not dried. If it can be made in the shade, its quality will be better than if subjected to the fierce rays of the sun." We all know—at least our wives know—that when, in the fall, the pot-herbs, such as majoram, mint, &c., are gathered for the winter's consumption, they have to be dried, just as hay is dried. Now, if any one will try, this next October, the difference in flavour between two lots of herbs, one dried in the sun and the other in a shady place, they will soon see the effect the exposure of the former has had upon its savour.

The writer of the *Witness* recommends the use of *hay-caps* as a protection against the torrid rays of the sun as well as against rain, and I have no doubt that they are very useful for both purposes ; but I have never used them, so I cannot say anything pro or con. In England, where I made every year some 40 or 50 acres of hay, about one-third of which was clover and ryegrass, the rest " upland meadow-hay," I never saw caps used for either kind of grass. We always tried to make the hay, by frequent turning, create its own shade, and as a general rule, that is, at least four times out of five, we, in the S. E. of England, were not much troubled by wet hay-harvests. Our process of hay-making by constantly moving it—at least four times a day—and cocking it every night, could hardly be carried out here, as our farmers have been too long accustomed to the old plan and many of them think the English way too expensive in hand-labour. Still, I think, an approximation to our process might be introduced here, without being over costly, and, in the neighbourhood of our great towns it would certainly pay, as, in Montreal for instance, there are many old countrymen among the buyers who know what good hay is, and are always ready to give a good price for a superior article. My plan would be something like this,—premising that the grass is just in bloom—very green, in fact :

Begin to mow about 2 o'clock in the afternoon, letting the grass lie untouched all night. The following morning, as soon as the dew is off, set the *tedder* to work, and let it go over the ground at least twice before noon and once during the afternoon. Towards 4 o'clock, horse-rake into large win-rows, and get it into *moderate sized* cocks, taking care to rake all over the ground and clean up thoroughly round the cocks. In the morning if fine, open out the cocks into large, wide beds, and let the tedder go over them as often as you can afford time. In the evening, *before the dew falls*, get the hay into win-rows and *large* cocks, which may be opened as soon as the weather looks suitable in the morning and carried to the barn or stack.

Thus, the grass mown on Monday afternoon, if all goes well, will be fit for the barn on Wednesday evening. With us, in England, it would not be fit to carry before Thursday, but our meadow grass is far more succulent than the timothy of this country.

And, do you ask, how does this constant moving about of the hay afford shade ? The answer is ; by constant moving, new surfaces are supplied that shade those parts previously exposed to the sun.

Clover is, of course, made in a different way. It should be stirred as seldom and as gently as possible. Mr. Eale, of Sherbrooke, as you will have seen by his letter in a late number of the Journal, is now determined to cut his clover in its early bloom—very green, in fact. I am *sure* he is right, for the greener it is cut, the less chance there is of knocking the leaves off, and although stems and heads are what compasses the principal contents of the clover brought into Montreal for sale, the leaves are what are desired by all good judges. It would pay any farmer to give a look at Mr. James Drummond's barns full of clover, on which he places such dependence for his milch-cows' support during winter. (1)

Clover should be mown in the early morning ; raked into narrow win-rows before 1 P. M. ; turned over lightly without the least shaking, once by 4 o'clock, and got into smallish cocks before the dew falls. The next morning, turn over the cocks very lightly, and, if the hay is at all "clung," turn once more, and then get it into large cocks to cure there until ready for carrying. All the turning required should be given in the early stages of clover-making, as the leaf then adheres more closely to the stems.

Where clover is mown with the scythe, I should wait till the upper surface of the swathes is fairly wilted, and then turn them over quickly with a long light pole, or with the handle of a rake. When the new surface becomes wilted, the clover can be put at once into large cocks to cure as before. For this reason I like mowing heavy crops of clover with the scythe ; there is less moving required, and the leaf, in consequence is better preserved.

The second crop of clover should always go into the silo. It is much more difficult to make than the first crop, and the weather, when it is fit to cut, is generally very catching.

HAY-CAPS.—G. C., Mossboro, Ont.—Q—This has been a catching season for hay, and as I have lost some by excess of wet, I am seriously thinking of getting some hay-caps. What is your opinion of them ? Also, what is the best way of making them, their cost, &c. Ans.—I think they are not only valuable to protect hay from rain, but worth all their cost in improving the quality of the hay by protecting it from the scorching rays of the sun. Hay should be cured, not dried. If it can be made in the shade, its quality will be better than if subjected to the fierce rays of the sun. As a protection against rain, they are a good investment. They are made of cotton sheeting, two yards square, with pins attached at the four corners with strong twine. A hundred, properly made, will cost about $40. They will last many years, if taken care of, and are just as useful for sheltering grain as for protecting hay. Any farmer who wishes to raise

(1) Mr. Fisher, Knowlton, said, at the Dairymen's Montmagny meeting . For hay, I always cut my clover very green.

first-class clover-hay, should provide himself with hay-caps. Clover is so susceptible to injury from rain, that a single wetting depreciates its value very greatly. It is also hurt by exposure to the direct rays of the sun. The use of hay-caps will add to the feeding value of hay one or two dollars per ton each and every year.

"Sir J. B. Lawes has been growing wheat continuously on the same land, without manure or rotation, for forty-seven years, at Rothamsted. His forty-seventh crop, last year, yielded, on one acre, nineteen and three-eighths bushels, and, on another, twenty and three-eighths. He says that there has not been a year in the whole forty-seven when his wheat yield from this land was not greater than the average of the world. When twenty bushels can be grown at the end of forty-seven years of such treatment; by tillage alone, in an old country like England, it is certainly well for us to revise some of our American ideas."

Dr. Hoskins is a man singularly devoid of prejudice. If he, a very outspoken man, sees anything deserving of praise, he never stints his praise. *Mutatis mutandis*, I would say: "it is certainly well for us to revise some of our *Canadian* ideas." Our land is good, our summers are propitious, our implements are not inferior, and our crops are—well, I am almost ashamed to think what they are. And why are they such as they are? Principally owing to our negligent way of putting the seed into the ground. Observe; Dr. Hoskins says: When twenty bushels an acre can be grown after 47 years of such treatment, by *tillage alone!* And the average wheat crop of the province of Quebec, with a rotation of some sort, manure, combined with such tillage as it gets, is less than half of what Lawes grows, after 47 years continuous cropping with the same plant, no manure, but with plenty of tillage. Well may many of our agronomes advise us to devote ourselves entirely to dairying and give up growing grain entirely! But I hope for better things from my friends and readers.

I have just received from the Secretary of Agriculture of the United-States, a copy of "Six lectures on the Investigations at Rothamsted Experiment-station," delivered by Robert Warington, F. R. S., before the Association of American Agricultural Experiment-stations, at Washington, D. C. These lectures are full of information, both practical and theoretical, and I hope to be able to lay before my readers a résumé of them which will give some idea of the wonderful work Sir John Lawes, a private English gentleman, has been doing for the last fifty years without the slightest assistance pecuniary or otherwise, from government, but purely at his own expense.

Rothamsted is about 25 miles from London; the manor has been in the hands of present family for about 270 years.

Sir John Bennet Lawes, Bart., was educated at our great College of Eton, (1) and at the University of Oxford. Thus, he was not only a gentleman of family, but an educated gentleman, both of which facts would, 50 or 60 years ago, have prejudiced people against him as a teacher of agricultural practice as much as the same facts prejudice farmers against educated gentlemen in the province of Quebec to-day. But as men who are really in earnest about never mind what, can live down prejudice in our part of the world, it took but a few years for Lawes to prove to the average English farmer that he had the root of the matter in him.

Sir John enjoys the advantage—I at least have a right to call it so—of being the product of a very great cross of blood. He is decended from the family of Wittewronge, who originated to England from their native Flanders during the religious persecutions, about 1564, and settled in Buckinghamshire. In 1623, the manor of Rothamsted was bought by John Wittewronge, who was created a baronet by Charles II, and heirs male soon failing, the Lawes family succeeded to the estate by marriage with Mary Bennet, great grandaughter of James Wittewronge.

How and why he began to interest himself in experimental agriculture he shall tell himself:

At this time I had the home farm, of about 250 acres, in hand. I entered upon it in 1834. Farmers were suffering *from the abundance of the crops*, and wheat, though rigidly protected, was very low in price. For three or four years I do not remember that any connection between chemistry and agriculture passed through my mind; but the remark of a gentleman (Lord Dacre), who farmed near me, who pointed out that on one farm bone was invaluable for the turnip crop, and on another farm it was useless, attracted my attention a good deal, especially as I had spent a good deal of money on bone without success. Somewhere about this time a drug broker in the city of London asked me whether I could make any use of precipitated gypsum and spent animal charcoal, both of which substances had at the time no market value. Some tons of these were sent down, and as sulphuric acid was largely used by me in making chlorine gas, the combination of the two followed.

To show the extent of the experiments carried on at Rothamsted, extensive both in area of land and of time employed, I append an account of the systematic field experiments at Rothamsted, from 1843-91:

Crops.	When begun.	Duration	Continued or ceased	Plots.	Area.
		Years.			*Acres.*
Wheat.	1844	48	Continued	37	11
Wheat and fallow	1851	40	do	2	1
Wheat (varieties)	1868	15	Ceased	20	4-8
Barley	1852	40	Continued	29	4¼
Oats	1869	10	Ceased	6	
Beans	1847	32	do	10	1¼
Beans	1852	27	do	5	1
Beans and wheat	1851	28	do	10	1
Clover	1849	29	do	18	3
Leguminous plants *	1878	14	Continued	18	3
Turnips †	1843	38	Ceased	40	8
Sugar beet †	1871	5	do	41	8
Mangel-wurzel †	1876	16	Continued	41	8
Potatoes	1876	16	do	10	2
Rotation	1848	44	do	12	3
Meadow	1856	36	do	22	7

* Continuous with the clover. † Continuous root experiments.

Trials, in pots, showed the value of manuring turnips with bones dissolved in sulphuric acid, and, after field experiments with the same manure and crop, Lawes finally was induced to take out a patent (1842) for treating mineral phosphates with sulphuric acid, which was the commencement of the present enormous manufacture of artificial manures.

Like M. Ville, the great French agricultural chemist, Mr. Lawes soon felt that each particular kind of plant had a special desire for a particular kind of food, and hence the necessity of studying the apportionment of each constituent of any manure to certain categories of plants. It is doubtless true that a mixture of phosphate of lime, potash, lime, with a certain amount of nitrogenous matter is sufficient for all the wants of plants; but it is no less true that some one or other is more suited to the wants of one kind of crop than to the

(1) Eton College is a *school*. There are at present nearly a thousand boys there.

wants of another kind. Thus wheat, tobacco, rape, sugar beets, and mangels demand nitrogen above all other plant foods. Turnips and swedes, on the other hand, ask for phosphoric acid; what plants, if any, seek for potash, is not yet a settled point, though in all longcultivated light lands where the manure cart is an infrequent visitor, I should be loath to leave it out of a rotation; and we know that clover, vetches, pease, and all other pod-bearing plants show a wonderful predilection for plaster, that is, I presume, for the sulphuric acid in its special combination in that manure; and this special ingredient of any manure is called by Ville by the expressive term: *the dominant constituent.*

Thus, in Lawes' experiments, he shows that upon the unmanured plot and upon that where salts of ammonia alone are used, the crop is limited in its supply of minerals, or ash-constituents, to the amount it can obtain from the soil. Where superphosphate is added to the ammonia, the power of the crop to obtain the alkalis from the soil is shown, and so on.

Again, we find that superphosphate has much greater effect on barley than on wheat; that the alkalis aid wheat more than barley; which I take to be because alkalis take a longer time in the soil to become fit for plant-food than is afforded by a spring crop; for we must remember that *wheat* in England is always to be read, unless otherwise indicated, *fall* wheat (1) The extraordinary influence of phosphoric acid on swedes and turnips, and the comparative indifference of mangels to this constituent are also shown, together with the uselessness of ammonia or nitrates for pease, clover, &c.

And, observe, that the object of these experiments has not been to prove that this or that manure applied to this or that plant will *pay*, but to show the characteristic peculiarities of the nutrition demanded by that plant. For otherwise, it might be fairly said, as it is often said: " these experiments only show that such and such a manure is demanded by such and such a plant in this particular locality," whereas the plant itself is the same, and demands the same nutrients wherever it is grown, while the amount of the nutrients afforded must depend upon the richness of the soil in those nutrients.

Again, many a hundred experiments have been tried as to the effect different manurial matters have on permanent meadows. Any one who has applied plaster to his grass land in this country will have observed—if he has any powers of discrimination at all—that while that fertiliser has great influence on the growth of the clovers, wild vetch, &c., it has very little effect if any on the grasses. And so with the different dressings applied to the permanent meadows at Rothamsted. Phosphoric acid in the form of mineral superphosphate, or of bone ash dissolved in sulphuric acid, was most strikingly effective on the *clovers*, &c., while ammonia-salts and nitrates were wasted on such plants, though, when they were applied to similar plots of permanent meadow-land, the *grasses* were so much benefited that they almost over-powered the legumino æ. These meadows, my readers will understand, have been in grass for, probably, centuries, and are never broken up. They form, if I remember, part of the park surrounding the Manor-house.

" It is difficult," says Mr. Warrington, " now to believe that the herbage was ever alike over the various plots in the grass experiment, and that the striking differences in the development of individual species of grasses, clovers, and weeds are simply due to the persistent application of certain chemical salts.

Conducting field experiments with perfect accuracy is, probably, impossible, still, I believe we may say that the pains taken without sparing time, labour, and expense, at Rothamsted have imparted to the trials carried out there a degree of trustworthiness unparalleled in our experience of agricultural investigations. An American farmer upon entering " Broad-balk Field " observed to Mr. Warrington. Americans have learned more from this field than from any other experiment in the world.

In this field, wheat has been grown every year for forty-eight years, and it certainly does not seem to have lost its fertility. In 1890, nine of the manured plots yielded upwards of 40 bushels of dressed—emphatically *dressed*—wheat to the acre, and on one plot the yield exceeded 50 bushels.

The great difficulty in the continuous growth of grain on the same land seems to be that of keeping the land clean. A great deal of hand labour is necessarily expended in this work, as the horse-hoe cannot be used in the cleaning of the plots: it would mix the soil of one plot with that of its neighbour.

One of the greatest mistakes I have met with at the experiment-stations on this continent, at Guelph particularly, in former days, is the selection of rich soil for field experiments. The history of the practical exhaustion of the soil of the Rothamsted land I fully treated in a former number of the Journal, see vol. 1887, p. 130. When rich land is operated on, the effect of manures is at first very trifling, and much time and labour is wasted before satisfactory deductions can be made from any series of experiments. I quote from memory, but I think accurately, when I say that the land devoted to experiments on turnips was sown with that crop for seven successive years, until the yield was reduced to a few pounds to the acre—650 lbs I think—, and not till then were the experiments with the different manures commenced

The land intended for wheat, too, was not put under trial, until a whole unmanured rotation of crops had been carried off—turnips, barley, seeds, wheat, were grown in succession and no manure applied, then, and not until then, the experimental application of different fertilisers began.

The size and shape of the experimental plots and their general arrangement, are not simple matters for consideration. How shall uniformity of soil in all the plots of each individual series be secured? At Rothamsted, the practice recommended is to mark out the plots, and to grow the crop intended for experiment all over the field, without manure of course; and to do this one or two years in succession, weighing the produce of each plot. In this way, any irregularities in the soil will be easily detected

Very small plots are always to be avoided, for they cause a considerable area of the field to be taken up by footpaths, a condition fatal to trustworthy results, the supply of light, moisture, and plant food by the side of a footpath being much in excess of that in the midst of a crop; as any one may see by comparing the outside rows of two pieces of different root crops, say of swedes and carrots sown side by side. There is, too, always a greater produce on that side of a land, or ridge, facing the south, in fact, it is impossible to exaggerate the effect on the yield of crops of the slightest variation of treatment. On this, consult Stephens' Book of the Farm, the reference to which I hope to find on my return home.

How to distribute artificial manures equally over the surface of a plot, is another difficult task. Choose a day free from wind, mix the manure with finely pulverised soil, and sow broadcast, going over the land twice. For root-crops, the superphosphate can be sown with the drill.

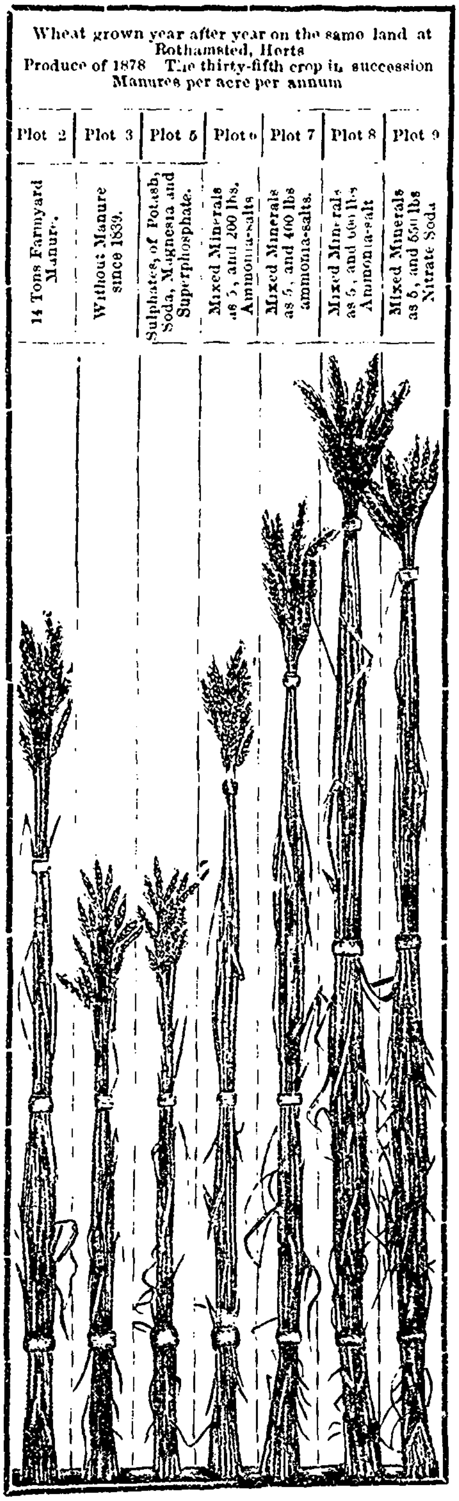
In the experiments on fattening animals, which were carried on from 1847 to 1851, no food was used without previous analysis.

The composition of the fattened animals, and especially of their increase while fattening, ascertained in these experi-

(1) Practically speaking, there is no spring wheat sown in South-Britain. A. R. J. F.

ments, taken in connection with the composition of the food supplied, *enabled Messrs. Lawes and Gilbert to maintain the doctrine of formation of fat from carbohydrates at a time when it found little acceptance among physiologists.*

I shall, I hope, return to this subject in next number of the Journal.



WHEAT GROWN AT ROTHAMSTED

I regret to say that the engravings of the Manor-house and its proprietor, Sir John Bennet Lawes, Bart., cannot appear, as the paper on which they are impressed renders it impossible to transfer them to our Journal.

ARTHUR R. JENNER FUST.

Nowhere we feel it safe to say, has more exact practical knowledge been reaped in the investigation of a single subject —and that a most important one—than in this work done at Burlington, to test the comparative feeding value of corn fodder and silage. Our space does not allow us to give it in full, but any reader can get the Bulletin embodying the same facts by application to the station. The summing up is contained in the following paragraphs :

Comparing two ensilage periods with the fodder, or two fodders with the ensilage, as to amount produced by one pound of dry matter of the experimental fodder, we find that a pound of dry matter in ensilage produced more milk than a pound of dry matter of fodder in six cases out of nine, more solids in six cases out of nine, and more fat in six cases out of nine.

The difference in amounts of solids and fat are not large, and are so small that they can almost be left out of account; and we can say that ensilage increased the quantity of milk decidedly, but at the same time it decreased the quality of it just about enough to over-balance the increase in quantity, so that the final result is that there is but little difference between the amount of milk fat produced by a pound of dry matter in the form of ensilage, and in the form of stooked corn fodder.

The labor required in feeding was largely in favor of ensilage. It took nearly as much time and expense to bring the corn fodder to the barn and stook it, as it did to run the corn through the cutter into the silo, but it took several times as much labor and expense to bring the corn from the stooks into the barn and cut and feed it, as it did to take the ensilage out of the silo. The cows seemed to like the ensilage a little better than they did the corn fodder, though they ate the corn fodder with a great deal of relish.

But it must be understood that this comparison is based upon a high grade of silage and the very best corn-fodder. This is the way the latter was treated :

The half of the corn that was to be stooked was brought to the barn and put in stooks on a slightly sloping piece of ground just outside the barn. The stooks were made rather large, to contain from four to eight hundred pounds. The tops were drawn together as tightly as two men could do it with a large rope, then bound with cord. After they had stood and shrunk for about two weeks the bands were tightened. This caused them to keep the rain and snow out quite completely, and the fodder kept in a most excellent state of preservation. When the last was fed out in the spring, some time after the snow had gone, it was still bright and green in the middle of the stooks and showed no signs of heating or decay. DR HOSKINS *in Vt. Watchman.*

Cheese-making in Hot weather.

During hot weather, that is, generally speaking, from the end of June to the end of August, it will rarely be necessary to warm up the milk before *setting*, since it will usually be even too stale before it is poured into the vat. I wish to impress on all makers the necessity of testing their milk before setting, in the way I advised in the bulletin for April and May , proceed thus . Take 8 ounces of milk, in a cup, and a teaspoonful of rennets ; warm the milk up to 86 to 88 ; stir the mixture for a few seconds ; if the milk curdle in 10 or 15 seconds it is fit to set ; if it curdle in less than 10 seconds, it will work too quickly, and measures must be taken to deal with it, as thus : the steam must be kept up ; when cut down, warm up the curd more quickly than usual ; and as soon as the warming up is completed, draw off the whey until the curd rises to the top. In short, carry on the process so as not to be taken by surprise by a too rapid development of acidity.

1. In receiving the milk, during hot weather, refuse absolutely all sour stuff; be not induced, through dread of offending any patron, to accept any sour or bad-smelling milk. Your reputation is at stake, and, depend upon it, the majority of your patrons will support you.

2. Do not begin to warm up your vat till almost all your milk is in it; warm up then to 86° or 88°; use enough rennet to curdle the milk in 35 to 40 minutes. Dissolve your rennet in water at the rate of at least a quart to 1,000 lbs. of milk. Stir the rennet well into the milk for about 4 minutes, if the milk be not very stale, in that case 2 to 3 minutes will be enough: the floors must not be tramped upon so as to make the vat shake during the curdling.

3. As soon as the curd will break clean before the finger, cut with horizontal knife, at first lengthwise, and, a few minutes afterward, with the vertical knife, across first, and then lengthwise. If the knife-blades are not set very close, and your milk is working quickly, cut a fourth time.

4. Before warming up, stir the mass of curd with your hands to detach it from the bottom and sides of the vat, and if a few lumps of curd remain uncut, cut them fine at once.

5. Warm up gently at first, keep on stirring; raise the temperature, at the rate of a degree in 4 or 5 minutes, up to 92°; you may then warm up faster, if needs be, up to 98° to 100°.

6. Since the market demands a firm cheese, without porosity, stir well, with the little hand-rake, until the curd becomes firm. I insist upon it, that the maker must stir, and stir, and keep on at it, until the curd is firm.

7. Before the acidity begins to develop, draw off the whey until the top of the curd shows itself, and when ⅛ of an inch of sign is given by the hot iron, draw off the rest. If the curd threatens to be full of *eyes*, a little more acidity may be required, say ¼ inch by the hot iron test.

8. Draw the curd to the sides of the vat or of the sink. If the curd be not firm, stir it to let out the whey. Keep it at 96° as nearly as possible; cut and turn over every half-hour; after having turned once, pile the blocks 3 or 4 high, and do not allow the outside to lose its colour or you will have mottled cheese.

9. Some makers are afraid of having too much acidity when they grind the curd. The hot iron test after drawing off the whey, may be omitted. As soon as the curd will tear when drawn out and becomes mellow, which will be from 3 to 3½ hours after the whey is drawn off, if you have not let it cool too much, you can grind it. If it be porous, you must stir again and air it well to get rid of all the gas before salting. Sometimes, it will take from 1 to 1½ hour to get rid of all the gas.

10. Never salt till all the gas is gone; 2½ lbs. of salt to the 1,000 lbs. of milk; stir well and salt equally all parts of the curd. When the salt is completely dissolved, which will usually take 20 minutes, put the cheese into the moulds, (*forms*) making them as large as the moulds will admit of.

11. In an hour, take cheese out of press and turn down the bands. Place the followers perfectly level, and see that the bands are drawn tight at the sides of the cheeses and make no raised edges on them. If possible, turn the cheese the next morning to prevent any raised edges (*bavures*) or unequal places. Leave it in press at least 20 hours.

12. When the cheese is put into the curing-room, forget not to protect it from the air by means of cloths covering the whole of the cheeses, or by smearing with melted whey-butter. Do not leave a single spot unguarded, lest there should be cracks in it. Turn the cheese every day. In dry weather, water the floors every day.

13. Once or twice a week the whey-tank should be washed; first with cold and then with hot water. All these tanks if of wood should be lined with tin. If they are kept clean, a great deal of the annoyance arising from bad milk will be avoided.

14. Lastly, keep everything clean; fight filth as your worst foe. Never rest till everything is as clean as possible. Look to the weighing can, the taps, the pipes, the tubes, the strainers, the curd-knives, the scoops, the curd-mill, the pails, dippers, and thermometers. Never leave a morsel of curd hanging about: it might ruin the flavour of your cheese.

Scour out your milk-delivery room, and in cleaning the floors, clear out thoroughly every lurking place of filth. Make the factory and all around it as clean "as a new penny." Then, and then alone, you can hope to succeed in having the best cheese, the highest price, and the happiest of times.

Yours respectfully,

(*From the French.*) PETER MACFARLANE.

Tassels.—The Cornell experiment station has been testing the utility of removing the tassels from corn, with a view to increasing the yield of that crop. The results seem to show that there was no marked gain from removing tassels, and no uniformity in gain or loss in yield with respect to the treated and untreated rows, as many rows deprived of the tassels showed a greater yield than the alternate rows, and in many cases the reverse was the case. There were many more abortive rows in the rows where the tassels were removed.

In the trials at the Illinois station, the removal of the tassels had the effect of increasing the yield of the alternate rows, 80 in number, on $\frac{4}{10}$ of an acre by one pound! Of course, the removal had nothing to do with it. At the Maryland station the result of removing the tassels was decidedly unfavourable to the production of grain; and so on. The upshot of it all was that the labour of de-tasselling was wasted.

Aerating-milk.—At the same station, the Cornell, several tests of the keeping quality of milk that had been aerated by the several aerators and that which had not been aerated at all were made. From the milk as it came to the dairy house a half-pint bottle was filled. Different portions were then passed through the aerators and half pint bottles filled from them. These bottles uncorked were left exposed to the air in the work-room of the dairy house. Three times a day they were shaken and tested with litmus paper and by tasting until they were found to be perceptibly acid.

TABLE XII.—AERATION—KEEPING TEST.

Date.	Average Temp. of room F.	Champion. Temp. milk when set F.	Champion. Perceptibly sour hrs.	Star. Temp. milk when set F.	Star. Perceptibly sour hrs.	Powell. Temp. milk when set F.	Powell. Perceptibly sour hrs.	Not aerated Temp. milk when set F.	Not aerated Perceptibly sour hrs.
April 27	57	67	69	50	72	88	69	92	69
" 28	55	63	72	49	72	90	64	92	64
" 29	54	57	63	52	63	88	63	92	63
" 30	60	61	63	56	63	82	63	86	63
May 2	68	60	25	51	39	90	39	92	39
" 3	72	64	20	56	26	92	21	94	21
" 9	61	62	44	50	44	89	39	91	39
" 10	65	60	44	53	44	89	39	91	39
" 11	63	62	62	52	62	89	44	94	48
" 16	64	64	39	53	39	90	25	92	25
" 19	63	63	39	53	39	85	39	91	39
Average			50		51		46		46

It will be seen that the milk aerated with the Powell Aerator kept no longer than that which had not been aerated. That which was aerated by the Champion and Star aerators kept for a constant but not very long time longer than that which was not aerated This difference in favor of the aeration is considerably less than we had expected to obtain; but there were several conditions that are likely to have made this difference less than it would be under ordinary circumstances. In the first place the air in which the milk was set was comparatively uniform in temperature and free from contaminating odors; in the second place only a short time elapsed after milking and aeration, so there was little chance for contamination in the stable. Then again, all the surroundings of the cattle were kept as neat and clean as could well be done. We believe that under the conditions that affect most dairies the good effects of aeration would be more pronounced than those we obtained. But we are inclined to regard as extravagant the statement recently made, in a leading agricultural paper, that "aerated milk will keep at least three times as long as non-aerated."

The question is often raised whether milk that is intended for butter-making may be aerated and the cream afterwards successfully separated by the gravity process. Four trials were made in which the milk that had been aerated was set in Cooley cans at forty degrees side by side with milk of the same lot that had not been aerated. In all cases the temperature of the creamer was 40—44, and the milk set twenty-four hours. The results were as follows:

Aerated, av per cent. of fat in skim milk........ ..	.53
Not aerated, av. per cent. of fat in skim milk	.31

It will be seen that while there was some loss in the efficiency of the creaming of the aerated milk, it was not very great. What is remarkable is that the aerated milk suffered no fall of temperature after it was placed in the creamer, and was more efficiently creamed than the diluted milk set at sixty degrees (Table I.), where the fall of temperature was 30—35 degrees. This seems to be in direct contradiction to the theory which supposes that the fall of temperature after the milk is set is one of the chief factors in complete creaming by the deep-setting gravity process.

VENTILATION.

The subject of the ventilation of cowhouses is receiving a great amount of attention at the present time. Some notice has already been given in these columns of the opinions on the matter published by Prof. McFadyean, and in the current number of the *Journal of Comparative Pathology and Therapeutics* he goes still deeper into the question. He is in favour of having a cubic air space for each animal of at least 1,000 feet, while he points out that some county councils have adopted as low as 450 and 500 cubic feet. The writer of this article has previously pointed out that 1,000 feet is by far too much to allow, because the buildings would require to be either so high or so wide as to render them unhandy to work in, and in winter the temperature could not be kept up to a comfortable degree In addition to this, the cost of buildings erected on this scale would be enormous, and more than one-half of the byres in the country would have to be rebuilt to conform to it. But, apart from this, it is a grave error to suppose that mere air space is the proper arrangement to have. It is in the circulation of the air—the passage outwards of vitiated gas, and the passage inwards of fresh air—that the whole crux of the matter lies. A cubic space of 500 to 600 feet per head, with properly-arranged ventilators, is amply sufficient; so long as the animals have fresh air to breathe, the mere size of the space they stand in—if convenient for working—is of secondary importance.

It is with regard to the health of the animals, and the health of the people who consume their milk, that this question of ventilation has hitherto been discussed; but, in the volume recently issued from the Experimental Station of the University of Wisconsin, there is a record of experiments tried on the effect of ventilation on the milk yield of cows. Twenty cows were experimented with during fourteen days, being subjected to periods of good and bad ventilation alternately, but kept continuously in the "barn" all the time. The bad ventilation consisted in simply closing two openings—which usually acted as ventilators—with sliding doors, but still leaving a third door wide open, so that there was still access left for some fresh air. During the good ventilation days the cows showed an average increase of 551 lbs. per cow daily, or a gain of 3.57 per cent. over inferior ventilation. The average temperature of the byre was 66 9 degs. Fahr. with good ventilation, as against 73.2 degs. under the other, or a difference of 6.3 degs. The effect of this was seen on the amount of water drunk by the animals. In round figures, at the higher temperature the animals each required 7 gallons, while 6 gallons sufficed those at the lower figure—the exact difference being 11 4 lbs. per head daily. The higher temperature, by causing a greater perspiration, required more water to keep it up.

Another point brought out was that the food consumed was practically the same in both instances, thus showing that there was no saving by keeping the place at the higher temperature. But alongside of this is the notable fact that the bad ventilation reduced the weight of the animals to the extent of 10¾ lbs. per head: that is, the average of the animals under the decreased amount of fresh air was this figure under the weights during the well-ventilated period. Whether or not the cows would have gone on decreasing under continuous bad ventilation, and *vice versâ*, is of course not apparent, but the fact remains that they rose and fell according to the amount of fresh air admitted.

An experiment preliminary to the foregoing had been tried with the same cows over a period of 122 days. On every alternate night the ventilators were closed from 6 p.m. to 6 a.m., while the cows had the run, of a yard in daytime when the weather was fine. After eliminating every possible source of error it was found that the lessened supply of fresh air reduced the milk yield one half-pound per head daily, and this where alternate supplies of air would tend to counterbalance any evil effect. It is more than likely that continuous bad ventilation would continuously reduce the yield of milk in a greater ratio than this.

Mr. F. H. King, who carried out these experiments, looks on them as only preliminary and not at all conclusive, but we can see that the evidence is all cumulative in one direction—viz., that in addition to gains with regard to the health and vitality of the animals, there is a direct gain in the milk yield that is worth considering.

It is of importance, therefore, to see to the proper ventilation of our cowsheds. It was pointed out above that mere air space enlargement is a mistake, owing to the expense it would involve and the unhandiness of very large byres, but the making of ventilators is quite another matter, and is a thing which ought to be thoroughly carried out. Openings along the ridge of the roof are the best form, because the vitiated air, being warm, rises there, while there is less danger of draughts; but windows which can be opened, or ventilators above doors, on wall tops, and so on, are not to be despised. So long as a sufficient supply is allowed access without draughts, and without lowering the temperature too much the objects will be attained. P. McConnell.

EARLY-CUT HAY BEST.—Of this there can be no "probable, possible" doubt. It seems scarcely necessary to enter upon a long scientific disquisition upon this point of practice, but those who wish to know all about it should read the pamphlet reprinted from the Bath and West Journal, and referred to last week, by Dr. J. Voelcker and Mr. Martin J. Sutton. The early cutting of hay is beneficial in all respects, because the total produce of the meadows is not decreased by a slightly lighter hay crop. The quality of the hay is much better, and the aftermath is earlier and more valuable. To this may be added the fact that grasses when late cut are weakened in constitution, so that when we say that late-cut grass crops "draw" the land, we should be more correct in saying that they "draw" the grass itself and render it weaker. Seeding is the final effort of the plant's growth, and if we can cut so as to save the plant this exertion it will thicken in growth and develop more herbage. That early-cut grass is in all respects more nutritious than late cut grass is well known, and is explained in a great measure by the fact that when allowed to stand too long the juicy and succulent *cellulose* which so largely composes the stem becomes changed into indigestible woody fibre. The starch, sugar, and albuminoids also collect in the seeds, which, in hay crops, is not desirable.

Eng. paper.

EARLY-CUT HAY.—Our long-time and valued correspondent, Mr. S. T. Floyd, in his article last week referred to the feeding value of early-cut hay. We call it up again for the reason that it is a matter to which the editor of the *Farmer* has recently had his attention called in his own practice. We have for some time past been feeding extra early-cut hay to cows giving milk, and also to fattening oxen. While experience with such hay has before led us to dislike it, we must say that this latest trial has more than confirmed our former estimate of it. We do not like early-cut hay as a stock-fodder. The reason we do not, is because the stock does not eat it as well as later cut, it does not contain the substance, nor will it produce the results, either in fattening oxen or making butter. Judging from experience in feeding, we get the best results from grass that stands till it has arrived to its full maturity.—*Maine Farmer.* (1)

Professor A. J. Cook says, in the *Tribune*: "As I have often urged, there is no substance so excellent to kill injurious suctatorial insects as kerosene emulsion. It is quick death to lice of cattle, hogs and horses, and to sheep ticks. It is easily made and very cheap. Many a stockman is thankful for having learned of this insecticide for stable and sheepfold. This same kerosene emulsion is equally valuable against plant-lice and other insects; last year we actually killed the terrible rose-chafer by its use. My formula for its manufacture is as follows: Dissolve one quart (one pint will do very well) of soft-soap, or one-fourth pound of hard-soap, in boiling water; then remove from the fire and add, at once, one pint of kerosene, and stir violently by pumping the mixture back into itself with a force pump; I know of no good way to stir hard enough, except by use of pump or syringe; stirring with a stick will not do. After about three minutes' stirring it looks like rich cream, and will then remain permanently mixed and bear any dilution with water, with no separation of the oil. This formula gives a perfect emulsion with any water, and even if the oil is ice-cold. For treating stock this may be used with little or no dilution. For plants it should be diluted so that only one-fifteenth of the whole is kerosene. If the emulsion is not diluted at once, a gelatinous mass is formed which does not break up easily with cold water. It is easy to dilute the first day with cold water, after that the diluent should be hot."

Group of Cheviot Ewes, the Property of Mr. D. F. Wilber, Oneonta, N. Y.

Crops
Seasonable Notes.

THE SOIL.

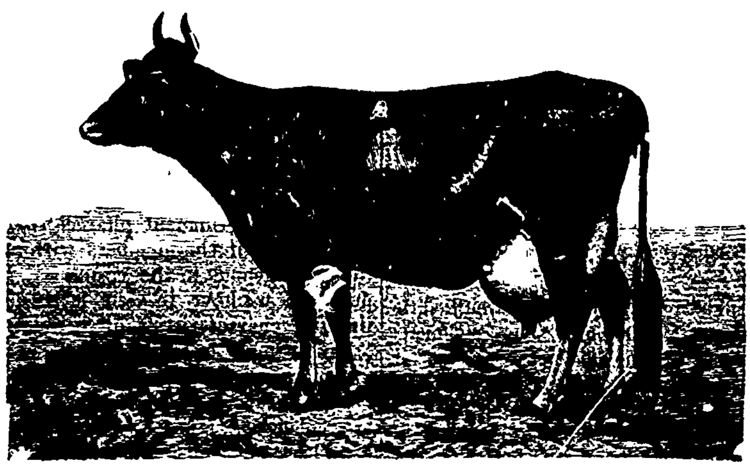
Few raw materials are so complicated as the soil. Let us consider for a few moments the constitution of this familar substance. The soil is well worth the attention of farmers, but it is a subject upon which many farmers bestow but little attention. It is true that, in a sense, most of those who live by the land are students of the soil. They are alive to the differences between good and bad, light and heavy soils, and they are skilful in tilling it. They are, however, in most cases more practical than scientific, and we do not quarrel with them for this. One ounce of practice is better than a ton of theory without practical knowledge, but a fair seasoning of theory or science can be no disparagement to a practical farmer. On the contrary, some idea as to the composition and constitution of soils is exceedingly valuable, especially as an aid to successful manuring and judicious cropping. The subject is, indeed, so large that we may be pardoned if we break off in the middle, and resume it on a future occasion.

THE AGE OF THE SOIL.

If we wish to realise the venerable antiquity of the soil we must study geology. Soil is one of the slow results of time. It has been produced by the action of forces which are still at work. The same gradual decay which in time wears away the solid rocks, and resolves granite into its component parts of clay and sand, is the cause of the loose material which overlies the earth's surface, called soil. All rocks are subject to its irresistible power, and limestones, clay rocks, sandstones, and the compacter marbles, porphorys and greenstones, are all in time, when exposed to atmospheric changes, slowly but surely disintegrated and redistributed in the form

(1) Compare and judge! A. R. J. F.

of soil. How long a time may have been required to effect the formation of a soil it is quite impossible to say, but the extreme slowness of the process points to its continuance through unknown ages, extending back far beyond the time when there was not yet a man to till the ground. Neither is it correct to entirely attribute the soil to the processes of slow decay, for they have been also formed by the direct wearing action of water, the more rapid grinding action of glaciers during the glacial period, and the transporting effects of rivers and the ocean. All the running water in the world is engaged daily in either making or removing soil, and every beach and river-course gives evidence of this effect. Soils are, then, the result of decay and attrition, or wear. In many cases the soil rests upon the rock from which it was derived, and partakes of its character. Such are chalk, limestone, and many clay soils, which rest upon a foundation of the same rock which has yielded them. These are called sedimentary soils. In other cases they have have been brought from a distance by the action of water, in which case they are called transported soils. Every farmer who wishes to understand the nature of a soil should ascertain the geological formations from which it has been derived. He will find that one of the best keys to a knowledge of the variations of soil in his district is a study of the geological map, more particularly with reference to the surface geology of the neighbourhood.



Imported Guernsey Cow Select 2205, the property of Mr. Francis Shaw, New-Braintree, Massachusetts.

THE CONSTITUTION OF SOIL.

There are, however, certain characters which are common to all fertile soils. They are, for example, all composed, although in varying proportions, of five very familiar substances. These are sand, clay, lime, vegetable matter, and stones. These form the bulk of every soil, and, as they predominate, the soil is termed sandy, clayey or argillaceous, limey or calcareous, peaty or "vegetable," and gravelly. Loams are mixtures of sand and clay in suitable proportions for cultivation, and may be heavy, medium, or light, according as the sand or clay predominate. Marls are mixtures of clay and lime, and vary from a distinctly calcareous to a pronounced clayey type.

THE BARRENNESS OF SAND, CLAY, LIME, AND VEGETABLE MATTER.

It is curious to note that in the pure or separate form none of these constituents of soil are fertile. Further, if even properly mixed, they would be far from giving us what we require, namely, a fertile soil.

The fertility of soils depends to some extent upon the happy commingling of these substances, but it is to the presence of certain substances which in nature are associated with them that the fertility is due.

By far the most striking example of this is Clay. Chemically speaking, clay is a hydrated silicate of aluminium. Clay, as we understand the term, is, however, a substance bound together by the silicate just mentioned, but composed largely of exceedingly fine, sandy particles, and it is generally red, owing to the presence of oxide of iron. Clay usually contains the important plant food potash, which originally existed in the granite or felspar from which it was derived. By virtue of the iron or ferric oxide which it contains, clay also has the power of retaining phosphoric acid, and, in a less degree, ammonia. Hence clay becomes a vehicle through which potash, phosphoric acid, and ammonia may be retained and presented to the roots of plants. It is always ready to seize upon and hold these substances when added in the form of manures, and hence clay soils are able to retain the most valuable fertilising materials much better than the lighter sandy soils. Clay is also retentive of moisture, and protects the soil in which it occurs from the effects of drought.

Sand is best described as small, hard particles of silica. Any small particles may be called sand, as, for example, calcareous sand or micaceous sand, and to these substances our description does not apply. We refer especially to quartzose sand, which is almost pure silica and is insoluble, and entirely useless as a plant food. The uses of sand are rather negative than positive. It prevents clay from being too retentive, and opens its pores so as to render the soil permeable to air, to water, and to the spread of the delicate fibres of roots. It is naturally warmer than clay, being a worse conductor of heat, and it has no power of absorbing moisture from the air, and small power to retain moisture. Sand, therefore, modifies the character of a clay soil, and renders it friable or easy to pulverise, dry, and warm.

Lime differs from both the last-named component parts of soils in being a true plant food. No clay or sand enters within the frame of the growing plant, but lime is an invariable constituent of the ash or mineral part of all plants. It has other functions besides that of being a plant food. It is one of the most important instruments for preserving potash and ammonia in the soil. The chlorides, sulphates, or nitrates supplied to a soil are decomposed by lime, forming salts of lime, which wash through the soil, leaving the alkaline bases in combination with the silicates of aluminium, which occur in all, but in a special degree in clay soils. Hence lime assists in holding important fertilising materials, and applications of lime to a soil are useful in this respect.

We have now seen how clay, sand, and lime act in conferring certain important fertilising effects upon the soil in which they exist. They are intimately associated with the presence of phosphoric acid, potash, ammonia, magnesia, and, by implication, of lime in the soil, and these are by far the most important mineral ingredients of the food of plants.

The Organic Matter in soils gives the peculiar dark colour to garden mould and to rich agricultural land. It is partly composed of the roots, leaves, stubble, and farmyard manure, &c., applied to land. It may be divided into the recent and most actively fertilising additions of these substances and older matter, which is termed humus. The organic matter in soils is useful on account of the nitrogen which it contains in organic combination with carbon This nitrogen is not at once available as plant food, but only as it is released by the action of *bacteria*, under the influence of tillage, moisture, and a suitable temperature. Nitrification takes place most actively in summer, and ceases to occur when the temperature approaches the freezing point of water. It consists in the disengagement of nitrogen from combination with carbon, and the oxidation of the same, so as to form nitric acid, especially in the presence of lime, which forms nitrate of lime, the most important element of fertility of all soils. Nitrate of lime is highly soluble and readily washes through the soil, but, owing to the wonderful provision already mentioned, it is chiefly formed during a period of the year when the roots of growing crops are ready to absorb it as soon as it is produced. It is the slow and seasonable nitrification which gives permanence to farmyard manure as a fertiliser. The organic matter in soils is most useful when new or recent. Hence the value of fresh dressings of farmyard dung and the value of clover and sainfoin roots, even when added to soils rich in humus. Organic matter is useful in absorbing ammonia from the air, and it also absorbs it when applied to the land as dung, or in the form of ammonia salts. It is a great absorber of moisture, and retains it with even superior force to clay. Hence vegetable matter is a safeguard against drought. It is also a perpetual source of carbonic acid, which is evolved during its oxidation. Thus, the air which is imprisoned within the soil becomes richer in carbonic acid gas than the atmosphere, and assists in dissolving plant food from the soil.

AN ACRE OF SOIL.

If an acre of soil nine inches deep could be weighed, it would be found to weigh about 1,000 tons. The enormous mass thus represented contains a considerable proportion of plant food The percentage of available plant food may be extremely small, but even a small percentage upon 1,000 tons gives a large number of pounds per acre. The amount of nitrogen in soils may vary from $\frac{1}{5}$ to $\frac{1}{10}$ per cent. on the whole bulk, and the amount of phosphoric acid or potash may be represented by similar fractions of a percentage. If the amount of any important ingredient be taken as $\frac{1}{10}$, or .1 per cent., it is clear that the total amount in a soil, taken at nine inches in depth, will be at least 2,240 lbs., and it actually will vary according to the specific gravity of the soil from this up to 3,500 lbs. per acre.

SHEEP AND WOOL.

Sheep, in their domestication and culture, are inseparably associated with the history of civilisation. Next to the culture of the soil, it is probable that a pastoral life was the earliest occupation of mankind, and hence we read in the oldest known account of human history, the Book of Genesis, "And Abel was a keeper of sheep, but Cain was a tiller of the ground." The story of the first domestication of the sheep is lost in the dim history of antiquity, but it appears to have been coeval with the first appearance of man, since we find its remains associated with the bones of the animals killed in the chase in the earliest cave and lake dwellings, when man was even unacquainted with the use of metals, and formed his weapons and tools from rude stones and flint. The place of its origin is also uncertain, but there are a number of converging lines of evidence which seem to indicate that its original habitat was somewhere in the highlands of Central Asia, in the neighbourhood of Afghanistan, and from this centre it spread in every direction along with the migrations of early man. The stock from which it was derived is also a matter of dispute, although the existence of a race of wild creatures, such as the Aoudad (*Ammotragus tragelaphus*), the Argali (*Ovis ammon*), and the Moufflon (*Ovis musmon*), in Asia, Europe, Africa, and America, which possess a similar affinity to the sheep that the wolf does to the dog, has led some naturalists to suppose that this may have been the source from whence it was derived by cultivation and breeding. Certain structural peculiarities, however, seem to indicate that there is a much greater probability that all these wild animals themselves may, along with the domestic sheep, have had in the remote past a common ancestor, from which they have diverged in different lines during the long course of prehistorical ages. However this may have been, there can be little doubt that the sheep which we now possess is far in advance of its early progenitors, and the best modern sheep, as exemplified in the New Leicester or Southdowns, differ as widely from the first domestic sheep as one of the last Great Northern express locomotives does from the original "Puffing Billy" which now stands in South Kensington Museum. Few creatures seem to present greater varieties than the sheep, and this tendency to variation has no doubt been of the greatest service in the improvement of the breed, and tended at an early period to the complete differentiation of the domestic sheep from its wild progenitor.

The wide distribution of the sheep over every portion of the world undoubtedly indicates that a long period of time must have elapsed since its first removal from the place of its origin—a period during which local variations have had time to become permanent characteristics of the race, and thus stamp some of the members with all the appearance of creatures indigenous to the country. It is not necessary for the purposes we have in view in this article to go into the distinctive characteristics of the sheep as distinguished from other animals to which it stands related in the zoological scale, or even to enter into the peculiar features of the sheep itself, so far as its anatomical and physiological characters are concerned, since these must be well known to all who have been engaged in sheep farming; but it may be interesting to note that it belongs to the same great family which includes the various species of animals which we usually term cattle, such as the domestic ox and the antelopes, as well as goats. The last, which stand nearest in relation to the sheep, may also be termed wool-bearers, although they are not so in the highest sense of the term, because the fibrous covering of the goat can never attain those peculiar qualities which are distinctive of wool in the highest state of perfection—the *development of the fibre seems to be arrested at a certain* stage in its evolution, beyond which it never passes.

The great service which the domestic sheep renders to man depends upon two qualities. It is one of the best sources of animal food, inasmuch as it supplies both meat and drink—mutton and milk—and it also furnishes the best of all materials for clothing purposes, both on account of its warmth and durability—viz, wool. It is for this reason that it has always occupied a first position as a source of wealth and commerce, and we may indeed say that from an industrial point of view its chief end is to produce mutton and wool, because in the more civilised countries its place as a milk-producer is scarcely recognised. It is a fortunate circumstance, which renders the sheep all the more valuable, that whatever causes tend to improve the quality of the wool also tend in the same degree to the improvement and the quality of the mutton, but these improvements are not always in *the direction of early maturity or large dead-weight—considerations* which in this country, at least have often a predominant influence on the part of the farmer in the choice of the breed which he selects, because, from the close proximity to large food markets, the consideration of the carcase has frequently been even of higher importance than of the wool, especially since a lower range of prices for this commodity has ruled during late years.

The meat question does not strictly come within the range of this paper, but it may be noticed that its value will always be proportioned to the attention which is paid to the condition and health of the sheep, and negligence in this respect, as in the production of wool will always be attended with deterioration both in the quality and price which the article will command.

With regard to wool, it is most surprising what ignorance exists in regard to its properties and treatment, even in quarters where such want of knowledge would hardly be expected.

It seems almost incredible that in a country where woollen manufactures have reached their highest state of perfection, and the manipulation of wool engages the attention of such a large portion of the population, there are many customs and methods employed by the growers of wool which are seriously detrimental to the best interests of the manufacturers, and it is to be hoped that the spread of education, especially technical education, will remove these anomalies, and conduce to a closer working together of wool-producers and wool-users for a common end. Some of these difficulties and anomalies may be best understood if we explain the structure and method of growth of the wool fibre, and point out the peculiarities in the structure which are of greatest value in the use of wool for textile purposes.

A fibre of wool is not by any means a very simple structure. It is composed of a very large number of complex chemical compounds, which are very readily acted upon by various reagents, and which depend for their best qualities and stability very largely upon the health of the sheep—indeed, it may be asserted, without any fear of contradiction that no better index of the general condition of the health of the sheep can be taken than the condition of the wool, and the author has been able to read, under the microscope, the variations in this condition, written on the structure of the individual fibres, in the same way that the atmospheric variations are recorded on the weekly or daily sheet of a self-registering barometer. The fibres of wool are true appendages of the skin of which they are an outgrowth, and differ only in structure from the horns or hoofs, which, strange to say, are only modified forms of the same essential materials. The method of generation and growth is the same in all.

When attached to the animal, each fibre is implanted in a cutaneous depression or follicle, which is an involution of the epidermis, and corresponds with the epidermis in structure layer by layer. The fibre is fixed into this follicle and attached to the bottom by a dilation called the bulb or knob of the fibre which encloses the papilla or pulp from which the fibre is generated. In structure the fibre is built up of a series of cells, which undergo modification so as to constitute the different parts during the process of growth. Thus, the fibre is in living connection with the fibrous sheath of the follicle. The fibre itself forms a long (more or less cylindrical) body, part of which is embedded within the follicle, but the larger part is external to it and outside the skin. This portion is termed the shaft or stem of the fibre, and it usually decreases in diameter from the base towards the unattached extremity, where, when uncut, it terminates in a point of more or less fineness.

The wool fibre is a wonderful structure, being built up of hundreds—nay, even thousands—of individual cells, which are wonderfully correlated to each other and to the general structure of the whole fibre. Some idea of the complicated nature of this structure may be obtained when we state that in a single fibre of Lincoln wool it has been estimated there are no less than 500 to 700 cells in cross section, and 250 in every linear inch, so that there are about 125,000 or more in every inch of length in the staple. These cells differ in form and density in the various parts of the fibre, and it is impossible to injure any of these without impairing the organic unity of the whole and deteriorating its quality as material for use in textile fabrics. Considering that wool-producing is one of the chief functions of a sheep, it would not be a bad plan for a practical wool-user to be associated with the other judges at a sheep show, so that he could lend his judgment amongst the others in determining the relative merits of the wools on the various sheep from his standpoint. The wool fibre consists really of two principal parts, an inner or cortical substance which is composed of long spindle-shaped cells, upon which the density and elasticity of the wool depend. This comprises the larger part of the fibre. Outside this cortical substance there is an outer sheath or case composed of flattened horny cells, which bind together the cortical cells, and to this outer or epidermal sheath the lustre and firmness of the fibre are due. This outer sheath is built up in a regular manner, all the scales having free margins or edges which overlap each other, like the scales on a fish's back or the tiles on a house top, the free margins always pointing in the direction of the point of the fibre. These scales are always most numerous in fine wool, and they differ in character in every variety of wool; so much so that we are enabled to distinguish all the specific varieties of wool by the arrangement of the scales, and are thus frequently enabled to detect mixtures of different wools in cloth and other fabrics. In the natural condition these scales are laid down close to the shaft of the fibre, and are covered all over the surface with a fine gelatinous enamel; and Nature secures that they shall not be disturbed or injured by providing a natural unguent or grease, which is termed *suint*. This *suint* is a very fatty potash soap, largely soluble in water; and, by its covering the whole surface of the fibres, it prevents the scales from coming into juxtaposition, and thus all felting action is prevented; for the felting property of wool is due to the interlocking of these scales. If once this *suint* is removed from the surface of the fibre, the scales are left without protection, and subject to attrition from friction with neighbouring fibres, which breaks their fine, delicate, free margins, destroys their lustre, and injures the flexibility of the fibre. So long as the fibres are enswathed in the *suint* all dirt or foreign matter is prevented from coming into contact with them, for even if dirt is present it only cakes into the *suint*, and not into the fibre, and when it is washed the *suint* dissolves and leaves the dirt free to fall off without any injury to the fibre itself.

When sheep are washed with the wool upon their backs, the *suint* is dissolved off the surface of the fibres, and the fibres themselves are left dry and hard, and even when they do not felt they never regain their suppleness and natural condition again. Quite independently, therefore of any question of cruelty to the animal which is compelled to carry a wet fleece on its back for days, with consequent injury to its health from damp clothing and the suppression of the production of *suint*, it is a positive injury to the wool, which can never after be rendered again so suitable for manufacturing purposes.

It is found from actual observation that much of the cotting, or matting, of the wool which occurs in some fleeces depends upon some functional disorder in the sheep which prevents the proper production of the *suint* from the skin; and thus the wool fibres, not being properly lubricated, mat together. This want of lubrication also makes the skin hard and dry, and the irritation tends to make the sheep restless; and thus the endeavour to remove this irritation by rubbing itself, either against the ground when laid down, or other objects when standing up, felts the wool into tangled masses. If sheep are dirty they will clean themselves in a grass field or straw yard far better than by washing, and the wool will receive no injury, whereas when washed the whole fleece is deteriorated. No washing of the wool ought to take place until it reaches the manufactory, and as soon as it is washed it ought to be sent forward into the first process at once. Next to the quality of wool, nothing is so important to the manufacturer as its condition, and the more natural its condition the better. Attention to this matter will well repay the farmer, because it will fetch an increased price, and give greater satisfaction to the user. The greatest care ought also to be exercised in the use of any materials on the wool, either as an insecticide or for other purposes, because many of these dips and washes are chemically of such a character that they impregnate the fibre of the wool, and are of very serious importance when the wool has to be made into fancy dress goods, where fugitive colours and light shades are required—often causing endless trouble both to the dyer and user, as well as loss to the manufacturer.

A word to the wise is sufficient; and the farmer cannot study too much the necessary conditions upon which the quality of the wool depends. The best breeds of sheep may give unsatisfactory results if their management is characterised by ignorance and stupidity. That which conduces to the best benefit of the sheep reacts all round, and is best for the wool-grower and wool-user alike; and the sooner this is learned and acted upon the better.

After the wool is shorn from the sheep it has to be packed and forwarded to the place of manufacture, which is seldom in the same neighbourhood where the wool is grown. In packing and transit the wool is subject to constant pressure and attrition—especially when, as in the case of colonial wool, the bales are subjected to screw or hydraulic pressure. When the natural *suint* or grease is left in the wool, the fibres are so protected that even this rough usage scarcely injures them in any appreciable degree, but when the wool has been washed the matting and felting which necessarily occur are fatal to the best using qualities of the wool, which can never be, by any after treatment, restored to its natural condition, and thus makes more waste, combs and spins worse, and causes a deteriorated quality of yarn.

As international communication becomes more perfect, the competition between wool growers in home and foreign countries will be more keen in every class of wool, and it will behove the farmers in this country to do their utmost to distance their rivals in the condition in which their wool is presented to their customers. If the precautions which have thus been pointed out are neglected, they will certainly be driven out of the market In the great race for supremacy, which will be a struggle for the "survival of the fittest," those will win who unite sound scientific knowledge with practical experience, and they only can reap the golden harvests of the future.

F. H. BOWMAN, D. Sc., F. L. S., F. S. C.

The Dairymen's Association of the Province of Quebec.

Quebec, July, 1892

Sir,—I have the honour to inform you that I shall pass the time from August 22nd to October 15th at the factories mentioned below, for the purpose of giving a practical course of lessons in the MAKING OF CHEESE AND THE TESTING OF MILK.

The Association, by means of the Inspector-general of the Syndicates, wishes to diffuse as much as possible the latest improvement in the modes of manufacturing dairy-goods, and invites you to attend, at least for one day, the lessons I am about to give.

On Thursday evening, at 7 o'clock, there will be a lecture for the benefit of the farmers who supply milk in that region. Invite your patrons to be present. It would be as well that your factory be represented by one or two of its directors.

Your devoted servant,

SAUL CÔTÉ,
Director of the School.

P. S — You can have your thermometers and lactometers verified by instruments I shall bring with me. I shall bring a Babcock with me.

Places where the school of the Dairymen's Association will be held during the latter part of the season 1892.

MONTHS	DATE	PLACE.	FACTORY OF
August	22 to 27	Ste Martine de Chateauguay	Edouard McGowan
"	29 to 3	Kinsey French Village, (Drummond).	P. C. Cartier
Sept	5 to 10	Ste-Béatrice de Joliette.	Onésime Boucher.
"	12 to 17	Ste-Ursule de Maskinongé.	Dephis Lessard
"	19 to 24	Ste Croix de Lotbinière.	Dr Rinfret, (village).
"	26 to 1	St-Ferdinand de Mégantic.	Louis Gilbert.
Oct	3 to 8	St-George de Windsor. (Richmond)	Adelard Marcotte.
"	10 to 15	Ste-Cécile de Milton. (Shefford)	Antoine Robert.

If any region be omitted, notice is to be given, by those interested, to the Secretary.

The Quebec Pea Crop.

(*Huntingdon Gleaner.*)

"The blow dealt the Province of Quebec by the failure of the pea crop does not seem to be sufficiently realized by city business men. The pea crop is the dependence of the *habitant* for money wherewith to meet his obligations. He grows some oats and wheat, and less barley, but they are mainly for home use. The crop he puts in with a view to sell is peas, and this year peas are a failure beyond all precedent. They started well and gave promise of ample yield until drowned out by the rains of the latter weeks of June and beginning of July. Peas are an irregular crop, but in the worst years heretofore known they always yielded something. This season few *habitants* will save their seed; the failure on low land is as absolute as could well be. There are *habitants* who had twenty acres and more in peas, who will have none fit to thresh. During the three years, 1888-90, the *habitant* did not reap sufficient from his fields to keep him square with the world. Last year he had a bountiful crop, which went far to put him on his feet. The failure of peas this year is going to knock him back to where he was. This means in the parishes a winter of stringency, and wholesale merchants may lay to account that they will make small sales and bad collections until another harvest. In the English-speaking settlements it is different. Peas is only one of several crops with them. An important crop, to be sure, whose loss will be felt severely by many, but still its loss will put them less about than if they had a poor yield of hay or of oats. They have secured abundance of hay and appearances are that they will soon have safe under cover an excellent crop of wheat, oats and barley. The expectations raised in the beginning of June are not going to be realized, but, on the whole, the English settlements are going to do fairly well."

As to the above, I was surprised that when, at the meeting of the Huntingdon Dairymen's Association, so much was said about the marvellous pea crops of the district, no one rose to advise the habitant to beware of trusting too much to one crop. My good friend Dr Ross, of the Legislative Council, never addresses an assemblage of farmers without advising them "not to put all their eggs in one basket": and he is quite right.

THE POULTRY-YARD

THE WHITE MINORCA.

I have been wondering why so little has been said in our poultry department concerning the White Minorca. It must be because the breed is not yet widely enough known for its many good qualities to be fully appreciated, as faults it has none, that I, as yet, have been able to discover. In egg production it is equal if not superior, as some assert, to the Leghorn, and being from one-fourth to one-third larger it is of course more desirable as a table fowl.

Like the Leghorns the Minorcas are exceedingly active in their habits, good foragers, energetic, and what the darkies call "shifty." This renders them easily kept, on a short allowance of food in all moderate weather, and makes them healthy and hardy. As to symmetry of form, beauty of plumage, and grace of carriage, the Minorcas are all that can be desired. I have a pure white cock that is the prettiest thing in the shape of a fowl that I have ever seen. He seems fully aware of his good looks, holds himself proudly erect, and struts back and forth as though on exhibition continually. His snow-white plumage is especially noticeable for its long and abundant hackle and saddle feathers, which fall in graceful and glistening points over the shoulders and back, dropping one or two inches down either side. His comb is single, upright, well serrated, and of a beautiful coral red; earlobes, smooth, close fitting, and so white as to appear pearl-tinted; wattles, thin, pendulous, and of a clear bright red—forming a lovely contrast to the glistening whiteness of his plumage. The breast is round, full, and prominent; tail, large, well expanded, and carried upright, with long and beautifully curved sickle feathers. Shanks and thighs are of medium length, stout in bone, and in color white or slightly pinkish Shanks and feet clean and free from feathers. Altogether, the bird is quite stylish and elegant in appearance. The hen of the White Minorca appears larger in proportion than the male, being long bodied, deep-breasted, and of a substantial build generally, and though she does not attempt quite so many fancy points, is really very handsome in form, and graceful in movement. Her comb resembles the Leghorn in its sidewise droop, and with her scarlet wattles and white earlobes, forms a pleasing contrast to her milk-white plumage.

Since I have kept the Minorcas on the farm, where they have had unlimited range and a great variety of food, the hens, while still great layers, now and then show a disposition to sit. This spring I allowed one that privilege, simply as an experiment, and afterwards gave her a pretty brood of chicks which she did h.- duty by most admirably, proving an attentive and affectionate mother and not offering to desert them till the proper weaning time. Indeed, after what I have seen of the White Minorcas, I would not be afraid to trust to them as a dependence for raising chicks for home use, that is, after keeping them under favorable conditions for a year or two. The hens too would be so much more satisfactory to keep all the year round, on account of not being such inveterate brooders, or so difficult to break up when they do take a notion to sit.

When we consider the weight of the Minorca--the standard for the adult male being eight pounds, and the female six and one-half pounds—I don't see why the chicks would not answer as broilers for family use. They would require a little longer time in growing than some of the heavier breeds, but we might hatch them early, and if fed so as to produce rapid growth, their flesh would be tender and juicy, of a fine grain and an excellent flavor.

The chicks seem to stand the cold wonderfully. Last spring I had some hatched in our big snow storm, and they were kept for weeks afterwards in a house without fire and so open that the snow drifted in continually; yet the tiny white birds lived through it all and were as lively as crickets. They feather out rapidly like the Leghorns, and at two weeks are well clothed, trim and shapely. The pullets mature early, and I fully expect mine hatched in March to begin laying before the summer is over, thus coming in when adult hens are moulting. An acquaintance of mine living in town kept six White Minorca hens last winter and says they furnished her small family with eggs all the time; and although they have tall single combs like the Leghorns, yet I find that keeping them up during the severest weather prevents their suffering from frosted combs. The poultry house is not heated either.

There are many persons like your correspondent, T. F. E., who "would prefer to make eggs the main consideration, and the table poultry to be secondary." To such, it seems to me, that the White Minorca, kept of course under the proper conditions, would come nearer giving satisfaction than almost any other breed. As H S. B., on the same page, truly says, it is unwise to expect the best layers to be first-class table fowls; but I am very sure that the prolific egg production of the Minorca would more than compensate one for the lack of weight in the young cockerels. The eggs of the White Minorca are of a fair size, nearer spherical than those of any other breed I have ever seen, and of a chalky whiteness, being distinguishable from both the Leghorns and the Black Minorcas.

The Black Minorcas are quite as desirable for laying purposes as the White, but according to my experience do not make as good brooders. Though indeed, mine have had but little opportunity in that line; the hens are so exceedingly fractious that I never let one stay on the nest long enough to see what she would do. They are the kind that like to catch your arm through a thin sleeve and give it a tweak and twist at the same time; while the White, though a little nervous, are not near so pugnacious. Lest any one should think that I am not wholly disinterested in praise of my pets, I will add that I have no fowls for sale. A FARMER'S DAUGHTER.

Country Gentleman.

Dairying in the Province of Ontario.

This progressive province contains two dairymen's associations—an eastern and a western—and a creameries' association. The former two have been in existence 15 years, the latter 7. From the latest annual report of these associations we quote from President Eager's address at the eastern. His advice is suited to the United States, and is in line with much that has been said in the *Country Gentleman:*

"Never in the history of our country have the farmers received so much of the attention of the legislators and economists as at the present time. Both the provincial and federal governments are doing all in their power to assist the farmers in every way that they possibly can, but we as dairymen should not depend too much on government help. We should rely upon ourselves. The sure road to success is having confidence in our ability to solve the difficult problems that crop up in our business from day to day. The secret of our success is to discover the forces and tendencies about us, and turn them to our use. Many people spend their time opposing and bewailing the changes that come up in their business, and thus waste their strength fighting against the inevitable. Others with a finer instinct discover the power that lies in this tendency, and set themselves to master the difficulty. It is a notable fact that one who succeeds in great enterprises invariably succeeds in new methods. They discover before the mass of their fellows have found it out, that the time is ripe for some new way of doing things, and they introduce they new way at the proper time. Business genius lies chiefly in the discernment of new possibilities of the hour by a clear conception of the changes and swift adaptation to these new conditions. Those who mean to succeed cannot tie themselves down to any particular method, but must be continually on the alert for new and better ways. This does not mean restlessness and departure from certain fundamental principles which remain unchanged, but it does mean quick perception of the facts that certain methods are outgrown, and that the times demand a change. This is a movement that carries men forward, and the successful man is the man who knows when the tide begins to rise and who rises with it."

The Babcock test has received careful attention and trial among the Canadians, with the result that Chief-Chemist Shutt says: "There are other processes quite as accurate as Dr Babcock's, but his is one of the easiest to manipulate, and we therefore recommend it for your adoption."

Prof. Roberts of Cornell was present, and read a paper on the dairy cow, closing as follows:

"For near a score of years we have been trying to improve the quality of our 'goods,' and have made some progress, perhaps raised the price of all cheese one half cent per pound, but in that twenty years 90 per cent. of all cows have virtually remained at the old standard of production. Yet it would not have been half as difficult to have raised the total product of the butter-fats of these cows 100 per cent. as to have taught the people how to *guess* at the right time of 'drawing the whey.' We have been so anxious about 'getting' the English market that we have been feeding and milking and housing two cows to do the work of one. We have been straining at an oil globule and swallowing two cows I have come to the conclusion that it will take six McKinley bills. earthquakes and a cyclone to make the dairymen of Canada and the United States run their dairies on anything like an economic and common sense basis. In ten years any man in Canada can have a good dairy herd, and that too without purchasing a single pedigreed animal. If he knows how to select from the thoroughbreds he may build a better dairy and in somewhat less time. In either case five things are necessary: *A man, a shotgun, a fat tester, a correct balance and a full meal bin.*"

At the western association meeting Prof. Dean described the "traveling dairy," a govermental device forecarrying best dairy methods among the people, of which he had charge. He took only such ustensils as would be used by a farmer in his own dairy, and the outfit cost about $40:

We were at Port Hope at the exhibition there, and made butter in the evening. There were a number of people from the town present. The cream was not first-class, but we made the butter, put it up in nice pound rolls, wrapped neatly in parchment paper, and the people were almost climbing over one another to get it. They paid the woman who furnished the cream twenty five cents a pound for it, and she could have sold ten times as much if she had had it. In Essex Centre, we held a meeting. After we had got through, a gentleman rose in the audience and said: "I want to say a word from the consumers' standpoint. If I were to go into a store and see butter on the merchant's counter such as is ordinarily brought in by farmers and bought by merchants, and marked at 15 cents a pound, and other butter, such as we have seen made here to-day, and marked 25 cents, I would take the 25 cent article every time. And I think I voice the sentiments of every consumer here." Nor were these the most extraordinary cases. At the town of Windsor, we had our last meeting When we got there, we found that no cream had been supplied (Sometimes we would get to a place where we did not know a solitary person, and find no preparations made for our meeting. We had to have cream or we could not do our work, and very often the cream had not been arranged for. Where we did not find it ready for us, we had to go and look for it. So it was in Windsor). We went to a restaurant an ice cream parlor—and asked if they had any cream. They had two gallons on hand. The man asked only $2 for it. Out of that cream, we got just three pounds of butter. From that fact, you can imagine how rich the cream was. We were not likely to make much money out of the speculation. But we did not come out so badly as you would think. When the butter was put up for sale, a gentleman in the audience said, "I will give you fifty cents a pound for it." So we lost just 50 cents on the transaction. These instances show that there are persons in Ontario who will give a good price for a good article. * * I always made it a point to visit as many private dairies as possible. When we went into a small village, I inquired who had dairies, and visited these places in order to find if there were difficulties in their way, and to give them such suggestions as I could as to the best means to overcome them. I think it is not always the fault of the women or the butter-makers of Ontario that the butter has such a poor reputation. If the farmer wants a new mower, or reaper or plow, he gets it. But let the women ask for a new churn, or something of that kind to make the work easier and improve the product, and at once there is grumbling, and the question is asked, 'Can't you get along with what you have?" * * When we got into a town, I made it a point to ask the storekeepers about the supply. I hardly ever found a man but would tell us that he wished this butter business was far enough. Most of them said that if they came out even, they considered themselves lucky. What the storekeeper means by coming out even is to buy butter at, say, 15 cents in trade, and sell it at 15 cents cash. * * I have seen only one merchant who has a proper place in which to keep butter. In one store in a certain part of the province, I found the butter kept in the basement of the building, in a place where you could not stand upright. Over in one corner had been dumped a lot of bad butter, and in this same place they were mixing up the good. You would be surprised to see the butter in such places. White butter, yellow butter, butter in pound rolls, in five-pound rolls, in crocks, tubs and pails—butter in every shape in which it could be brought in. I was in a store when a lady brought in two crocks of butter. When she went out, I looked at the butter and tried it. She had the crock full to the top, and the butter on top was rank and spoiled. If she had not filled the crocks so full, and had put some parchment paper or butter-cloth and had made a salt plaster and covered it over, the butter, if it was good in the first place, would have kept for a considerable length of time. But in the way it was packed, the best of butter would not keep. * * We held an institute at a certain place half a mile from the home of a prominent agriculturist of the province. His wife, who, by the way, was not brought up on the farm, came, and also another lady who thought she knew all about butter-making. The latter asked her, "How long does it take you to churn?" Mrs. —— answered, 'I seldom take more than twenty minutes." "Why," said the other, "I have churned sometimes for a whole day; last week, I churned for nearly two days. How do you make your butter come so soon?" She replied, "When the traveling dairy was around, I attended the meeting. I took a note-book, and I took down points that were given, and I noticed carefully what was said and done, and since then, I had no difficulty." One came to the meeting and could not be taught, and the other came to learn and received information which has been of great practical use to her. This work will go on next summer. Two travelling dairies will go out. More applications have been sent in for a visit by the traveling dairy than one man could fill in three years.

In the creameries' association meeting President Derbyshire said that the province sustained a loss of $1,500,000 from improper facilities in dairying, and that only 3 per cent. of their butter was made in the best way, entailing a loss of $2 700,000. Mr. Macfarlane, Dominion analyst, gave some statistics of Danish dairying England requires 100,000 tons of butter annually, of which Denmark supplies 41 per cent., the United States 4 per cent., Canada 0 75 per cent. But Denmark imports from Sweden 8 million and from Russia 4½ million pounds, reshipping the best to England. The increase of her own productions has been from 12 million to 14 million pounds annually in the last few years, chiefly through winter dairy. Instead of exporting grain they consume it in butter production, besides importing great quantities of feeding stuffs. Roots are largely used. Centrifugal separators and the partnership system of dairying put the small cottar on a level with the extensive farmer. In addition, close sympathy and cordial alliance exist between scientific men and the practical farmers.

The imported Guernsey cow Select 2205, whose portrait appears herewith, has a record of 22 lbs., 8 oz. of butter in seven days. For several years she has been in the Muster Hill Farm Guernsey herd at New Braintree, Mass. In this herd are six daughters of Select, and of Select 2d, (14 lbs. with first calf and half sister of Select) there are *four* daughters, all without exception show by actual test unusual richness. This herd of Guernsey cattle will shortly be removed from New Braintree to Wayland, Mass., when we presume it will be brought to the notice of readers in our advertising columns.

The accompanying cut, from a drawing by J. W. Hills, represents a group of Cheviot ewes belonging to Mr. D. F. Wilber, Crumhorn Stock Farms, Oneonta, N. Y. They were selected with special care for individual excellence, and Mr. W. hopes, we believe, to exhibit them at Chicago. As our readers know, the native home of the Cheviots is a bleak and mountainous district, and they are noted for ability to withstand exposure. They have a high reputation as a mutton breed as well as for their wool. An association of American breeders of Cheviot sheep was organized in January last, of which the officers are — President, Henry Van Dreser, Cobleskill, N. Y.; vice-president, Wm. Curry, Hartwick; secretary, E. J. Bruce, Ketchum; treasurer, T. N. Curry, Hartwick. (1)

Joseph Elkington, of Princethorpe.

By Professor Wrightson.

We reprint the following excellent paper from the *Showyard Chronicle* :—

Visitors to the Royal Agricultural Society's Showyard in these days seldom are blessed with the abundant leisure of our forefathers. They concentrate their attention upon the vast acreage of canvas which contains so much that is worthy of attention, and cannot spare time for topographical observation. We, however, cannot pass by in silence the fact that a pioneer in the important work of land drainage lived and worked within some ten miles of this busy scene. A hamlet in the parish of Stretton-upon-Dunsmoor, called Princethorpe, 6¾ miles from the town of Southam, and about the same distance from Coventry, situated upon or near the Roman Foss Way, which runs across the county from Stretton-on-Fosse to Stretton-upon-Dunsmoor, marks the home of Joseph Elkington. It is an obscure little place, situated in a lovely district, where the pilgrim in quest of agricultural knowledge might well pause for a moment to inquire for the farm and house of a man of great reputation during the last century. A man who was voted $1,000 by Parliament for his services to agriculture must have been a marked person in his time. He is accorded a position in every treatise upon land drainage, and was accounted a wise man in his neighbourhood. Elkington is said to have used the divining rod, and to have possessed occult powers in discerning the underground course of water. His skill, no doubt, aroused some feeling of superstition among the simple villagers and farmers of his time, but was rather to be accounted for by his deep knowledge of springs and the water economy of soils. This is not the place to describe Elkington's methods, although, if space permitted, it would be easy to quote from the numerous works in which his modes of proceeding are described. He appears, like many men of practice, to have been averse to committing his system to writing. He, however, willingly communicated all his practice to Mr. John Johnston, of Edinburg, himself an eminent drainer, who embodied them in a book which remains as a monument to Elkington's genius.

The late Mr. John Wilson, of Edington Mains, accorded Elkington a high position, as having been the most worthy successor of Captain Walter Bligh, who had drawn attention to the importance of drainage a century earlier. Bligh's teaching had been forgotten until Elkington, in 1764, goaded into action by the loss of several hundreds of his sheep by liver-rot, discovered an ingenious plan for drying his lands and ridding them of the "superfluous and venomous water" of which Blithe had complained. We may in these days picture the old-fashioned Warwickshire farmer, clad in homespun, puzzling over the sources of wetness in his fields. He had, according to Sinclair ("Code of Agriculture"), dug a trench 5 feet deep, which did not, however, reach the principal body of sub-jacent water. Here was a drain cut through the wet land which would not act. It is said that while he was deliberating what was to be done, a servant passed by chance with an iron bar for pitching hurdles. Here was his opportunity, so, seizing the bar Elkington proceeded to make a hole through the bottom of the trench, and on pulling out the bar, which is said to have penetrated 4 feet, up rushed a gushing stream of water, which ran along the bottom of the trench. This was Elkington's triumph, and from this fortunate commencement he gradually built up a system in which the tapping of springs was the chief object.

Elkington's system was that of irregular drainage. He cut drains where they appeared to him to be wanted, and employed the auger for the drainage of his own, and many other farms. Mr. Evershed relates, in his "Farming of Warwickshire," that Elkington's auger holes filled in time with the ochrey matter common in peat bogs. The occupier (1856) redrained the land after Elkington's principles applied in a more thorough manner. He made shafts 14 or 15 feet in depth, and filled them with stones to a level of one foot above the drain bottoms, and through these stones the water rises and pours off into the main outfall, leaving the land perfectly dry. Elkington's system is only applicable to land wet from

(1) Cheviots may, but no one who has ever tasted "black faced" 4 year old mutton would care for Cheviot mutton.

an accumulation of pent-up water which soaks through the subsoil and injures the herbage on the surface. This is what Mr. Bailey Denton has called " diffluent water," or water of pressure, and is not directly caused by the rainfall upon the wet surface. It is found only in lands underlaid by gravel or a porous material, which allows water to travel underground for considerable distances. It is evidently unsuitable for uniform clay soils, but appears to have been singularly adapted for the peaty soils resting on gravel, and interspersed with " binds " or retentive strata, which occur largely in Elkington's neighbourhood. The system was extensively practised over many thousands of acres until 1824, when Mr. Smith, of Deanston, invented the system of " thorough " drainage which required less skill, but is, in most cases, more likely to prove satisfactory. The regular system of drainage used by Smith is adapted to soils of homogeneous or uniform character, but skilful drainers who employ it are not forgetful of Elkington's methods, and use them in all cases where springs abound. It is found possible to combine both systems by cutting off water of pressure on the principles laid down by Elkington, and proceeding to provide for the carrying off of direct rainfall upon Smith's principle. In other cases, although the auger is not necessarily used, wide intervals may be employed in conjunction with continuously deep drains of to 11 or 12 feet deep cut down through the subsoil, until they reach the source of accumulated water beneath.

This is Elkington's principle, because it seeks the source of pent up water which, by rising through the superficial layers, injures vegetation. The auger hole was a mere accident in Elkington's system, and his principle was the same as that employed at Sudbury and other places, of finding the hidden sources of water and cutting them off so as to allow of a perfect circulation of air, and consequently of water throughout both soil and subsoil.

We would gladly know more of Elkington. He was a substantial man, who appears to have suffered from the trials and troubles to which all farmers are subject. To lose several hundreds of sheep from liver-rot was a severe blow, but, like a stalwart Englishman as he was, he boldly faced his difficulties, and, in doing so, rendered himself immortal. Honour be then to Elkington, the first and most notable of modern drainers! He was a man who would have rejoiced in the meeting of the Society at Warwick, and the modern advance of science. He was the natural predecessor of the improvers of cattle, sheep, and horses, as well as of all advancement in land cultivation, for without drainage (natural or artificial) it is impossible to carry out any other agricultural improvement. He deserves a monument, but, I know not if at the beautiful church of Southam, or in any other church, a tablet exists proclaiming his good work. Even Westminster Abbey would not be demeaned by such a stone, commemorating a worthy man who helped to make his country great, and that to no small degree. Let this brief note be considered as a small tribute to his memory rather than as a description of his work or a history of his life.

NON-OFFICIAL PART.