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Table of Contents.

Monthly Report of the Provincial Model-Farm at Rougemont.

NOTES ON THE INDIAN-CORN SOWN ON THE FARM.—To-day, June 6, we observed, with pleasure and surprise, that the corn planted on the 1st inst. was already up. Some of the stalks are from an inch to an inch and a half high.

It must be the excellent preparation which the land has undergone, combined with a favourable season, which has caused the rapid germination of this grain, generally so loath to sprout: warm rain almost every night, and a glorious sun all day.

The field in which the corn was sown was heavily dunged, ploughed, and harrowed. The drills were made, 3 feet apart, with the plough, and drawn very straight for the greater ease in hoeing. Every 30 inches, a shovel-full of dung was placed in the drills, with an inch of earth on the top of it, in which were set 4 or 5 grains of corn, covered by about 2 inches of mould.

This was rather a long job, but it answers better than the use of machines, as the seed finds itself in immediate contact with the dung. The corn finds in the manure on which it rests all the food necessary to hasten its germination and growth; and, as it increases in size, the roots and rootlet imbibe from the land around them, full of manure as it is, the supplies requisite to furnish fine grain and an abundant harvest. A small quantity of phosphate and ashes was also sprinkled on the drills. The Director of Agriculture called our attention to the fact, that this field was in an exceptional state; otherwise, the use of machines (sowing-machines?) would have done just as well.

TREATMENT OF FRUIT-TREES.—When the branches are cut or broken, a *styptic* should always be applied to the wound; otherwise, water will, inevitably, enter thereby, and the tree will rot. An excellent material for this purpose is composed of: $\frac{1}{3}$ suet, $\frac{1}{3}$ resin, $\frac{1}{3}$ bees-wax—equally suitable for wounds made in pruning.

If this is thought too expensive (bees-wax costs 15 c. a pound), fresh cow-dung mixed with a little coal-tar will answer all purposes.

There are three good plans for preserving trees from the ravages of rats, mice, and other rodents: the first consists in treading down the snow round the trees for a radius of about 3 feet. Begin in March, and repeat after each fall of snow. Secondly, make a heap of earth round each tree 30 inches in diameter and 18 inches high. Thirdly, the most simple way of all, surround each tree with a triangle or square, made of boards, two feet high. The boards must be well fitted, to prevent the rodents from injuring the bark.

GREEN-MEAT.—Indian-corn, Hungarian grass, and oats, are of the greatest utility as forage for cattle, winter as well as summer; but they are costly, especially oats, which commonly sell for 50 c. a bushel at seed-time. When sown for consumption by cattle in the green state, corn is the most profitable: it may be sown very late, and the yield is enormous.

Corn, as we saw, requires rich and well prepared land. It may be sown in such land as late as 13th or 20th of July; at which time the farm work is pretty light. Sown as above, the corn may be cut by the middle of September, and will probably be 5½ feet high, yielding 25 tons to the *arpent* (equal to about 29 tons to the acre. Tr.). Considering the abundant yield, we should always grow at least an arpent of corn for forage.

Oats sown early may be mown four or five times, but they should not be cut low, lest the roots should be injured.

PATURIN DES PRÉS, or FRANC FOIN.—A grass which, from ignorance of its good qualities, is too generally neglected. Sown very thickly, it forms an excellent pasture for milch-cows, and has the advantage of being remarkably early. In spite of the late spring, I saw on the 12th June stalks of this grass 22 inches high, and beginning to flower. Cut when in bloom, I have no doubt that this plant would make excellent hay for cattle in winter; and it grows so fast that two crops a year might easily be harvested. When allowed to stand too long, nothing will eat it; it should be fed off very early, and as the uplands dry off soonest in the spring, the lowlands should be reserved for later consumption: nothing injures the latter soils more than cattle poaching them into mud before they are well dried. This grass is as common as it is good and early. (1)

LIME.—Lime is commonly found in three states: carbonate, sulphate, and phosphate. (2)

(1) *Phosphate* is a vaguish term. Mineral or ammoniated? Was the ash of wood or of coal? A. R. J. F.

(1) I don't recognise the *pâturin* by that name. June grass? A. R. J. F.

(2) And in a dozen others; muriate, nitrate, oxalate, &c. A. R. J. F.

As phosphoric acid is a food indispensable in the formation of grain, we must come to the conclusion that phosphate of lime should be used on almost all soils, especially on clays and moory land.

In moory soils, the lack of lime produces certain effects injurious to the quality of the crops. These soils contain a great amount of vegetable matter, and lime prepares this matter for the plants to feed upon by converting the nitrogen held in combination into ammonia and nitric acid. It also neutralises the acid humic matter. *Muck* or *black earth* sometimes contains as much as 97 0/0 of vegetable substances, and in these soils, unless lime, in a caustic state, and phosphoric acid be liberally employed, the crop will be light in grain, though abundant in straw.

Lime is not a manure but an improvement. And, so, when land grows sorrel plentifully, it is an evident proof that it contains acidity in abundance, and that lime is wanted to dissipate it. (1) *From the French.*

D. C. Emile Roy.

Selection in grain-growing.

BY JAMES CHEESMAN, MONTREAL.

The principle of selection has long been appreciated by stock-breeders, and they have largely profited by the application of its teachings. As applied to the growth of cereals it has not found a very wide acceptance, not having had time to force itself on the attention of the average farmer. The founder of the practice of selecting grain for seed is Major Hallett, F. L. S., Brighton, England. In 1861, he planted ten grains of wheat, from a variety known there as Bellevue Talavera wheat, which up to that time had been sown as a spring wheat, and was declared to be quite incapable of withstanding the frost of winter. (2) Nine of the ten plants from these grains were killed by the severe frost, but the other plant, although from the same ear, remained as healthy and vigorous as any of the winter varieties of wheat by their side. From this surviving plant seed has been selected, and grown year after year as a winter wheat. Close observation shows that in the cereals, as throughout nature, no two plants or grains are exactly alike in productive power, and hence, that of any two or greater number of grains or plants one is always superior to all the others, although the superiority can only be ascertained by actual field tests. It may consist in several particular characteristics, as power to withstand frost; prolificness; size and character of ear; size, form, quality and weight of grain; length and stiffness of straw; powers of tillering; rapidity of growth; and many others.

Throughout continued observations and experiments, extending over twenty years, the grower has found only three instances recorded in which there were two ears on a plant containing an equal number of grains, and one of these related to the Bellevue Talavera wheat, which must be considered quite exceptional as to variation. In both the other instances there was only a low stage of development, the equally finest two ears of each plant containing but 59 and 49 respectively. In every case where the plant presented an ear containing 60 grains and upward, the next best ear was of less contents than the finest one. In twenty such instances taken consecutively and without omission, and referring to seven varieties of wheat, the average difference between the contents of the first and second ears was seven and a half grains. The difference in four of these instances was only one grain, but in other four it amounted to from seventeen to nineteen grains. The superior productive power of a grain over that of another may consist in a greater number of ears upon the plants it produces, or in their individually containing a greater number of grains.

During these investigations, no single circumstance more forcibly illustrated the necessity for repeated selection than the fact that, of the grains in the same ear, one is found to excel greatly all the others in vital power, as in the case of the Bellevue Talavera. The original two ears together contained 87 grains; these were all planted singly. One of them produced ten ears containing 688 grains, and not only could the produce of no other single grain compare with them, but the finest ten ears which could be collected from the produce of the whole of the other 86 grains contained only 598; yet supposing that this superior grain grew in the smaller of the two original ears, and that this contained but 40 grains, there must still have been 39 of these 86 grains which grew in the same ear. So far as regards *contents* of ears.

The next year, the grains from the largest ear of the finest plant of the previous year were planted singly, twelve inches apart, in a continuous row; one of them produced a plant consisting of fifty-two ears; those next to and on either side of it of twenty-nine and seventeen ears respectively; and the finest of all the other plants consisted of only forty ears.

The following are the *chief* points of the standard in the order of their importance, but all have to be duly considered:

1. Hardihood of constitution.
2. Trueness to type.
3. Quality of sample.
4. Productiveness.
5. Power of tillering.
6. Stiffness and toughness of straw.
7. Earliness of ripening.

The system of selection here pursued is as follows: A grain produces a plant, consisting of many ears. Then, are planted the grains from these ears in such a manner that each ear occupies a row by itself, each of its grains occupying a hole in this row, the holes being twelve inches apart every way. At harvest, after the most careful study and comparison of the plants from all these grains, the finest one is selected, which is proof that its parent-grain was the best of all, under the peculiar circumstances of that season. This process is repeated annually, starting every year with the *proved* best grain, although the verification of this superiority is not obtained until the following harvest.

The subjoined statement will illustrate this system of selection, as the facts given are due to its influence alone: the kind of seed, the land, and the system of culture employed, were precisely the same for every plant for four consecutive years; neither was any manure used, nor any artificial means of fostering the plants resorted to.

The following table shows the character of each additional generation of selection:

(1) Sorrel, *rumex acclosella*, almost always shows itself on sandy and gravelly loams *with a clay subsoil* when such land is first brought into cultivation. The sorrel disappear after drainage in places where, as in my part of England (Kent), lime is hardly ever used. "Tom Gisborne" says that, as regards our cultivated crops, the acidity is a *caput mortuum*—i. e. of no consequence one way or other. A. R. J. F.

(2) Bellevue Talavera—a Spanish wheat, cultivated for many years by Col. Lecouteur, Bellevue, Jersey. The grain is long in shape, and in colour of an opaque white; makes splendid biscuits (*crackers*, not rolls), and is worth from 18c to 25c a bushel more than ordinary white wheats. How Major Hallett can say "it was sown up to the year 1861 as a spring wheat and was incapable of withstanding the frost," I don't understand, seeing that his neighbour Wm. Rigden, my old farm-tutor, had certainly grown it regularly as a fall-wheat some years before 1852, when I went to him. The crop generally ripens a week before other wheats, and renting farmers usually have a field of it, which is threshed out and sold in harvest time to pay the wages. A. R. J. F.

YEAR.	EARS SELECTED.	Height.	Containing grains.	Number of ears on finest stool.
		Inches.		
1857	Original ear.....	4¾	47	..
1858	Finest ear.....	6¼	79	10
1859	Finest ear.....	7¼	91	22
1860	*Ears imperfect from wet season*.....	..	..	39
1861	Finest ear.....	8¾	123	52

Thus, by means of repeated selection *alone*, the length of the ears has been doubled, their *contents* nearly trebled, and the "tillering" power of the seed increased fivefold.

The following table gives similar increased contents of ear obtained in the other varieties of wheat:

Grains in original ear.	KIND OF WHEAT.	Grains in improved ear.
45	Original Red commenced in 1857.....	123
60	Hunter's White commenced in 1861.....	124
60	Victoria White commenced in 1862.....	114
32	Golden Drop commenced in 1864.....	96

It was supposed by ancient writers that the powers of grains differed in relation to their positions in the ear. This Major Hallett investigated in 1858, by planting the grains of ten ears on a plan showing their several positions in the ear. The only general result, among most conflicting ones, was that the smallest grains, those most remote from the centre of growth, exhibited throughout, most unexpectedly, a vigor equal to that of the largest; and that the remarked worst grains, in one or two instances, did not by any means fall so far short of the good ones as had been expected. Frequent trials have also been made of the comparative power of large and small, plump and thin grains, and, in the case of oats, which produce a small grain attached to a large one, trials as to their respective powers—with uniform results, viz, that, in good grains of the same pedigree, neither mere size nor situation in the ear supplies any indication of the superior grain.

Very close observation during many years led to the discovery that the variations in the cereals which Nature presents to us are not only hereditary, but that they proceed upon a fixed principle, and from them has been educed the following law of development of cereals:

1. Every fully-developed plant, whether of wheat, oats, or barley, presents an ear superior in productive power to any of the rest on that plant.

2. Every such plant contains one grain which, upon trial, proves more productive than any other.

3. The best grain in a given plant is found in its best ear.

4. The superior vigor of this grain is transmissible in different degrees to its progeny.

5. By repeated careful selection the superiority is accumulated.

6. The improvement, which is at first rapid, gradually, after along series of years, is diminished in amount, and eventually so far arrested that practically a limit to improvement in the desired quality is reached.

7. By still continuing to select, the improvement is maintained, and *practically* a fixed type is the result.

THIN SEEDING WITH SELECTION.—Let us discuss what is possible by a combination of thin seeding with selection. In order to do this, we must look at the present modes of cultivating the cereals. Confining ourselves for the moment to what alone, we know that from two to five bushels per acre are sown. The bushel of ordinary wheat contains 700,000 grains and more, and, taking two bushels per acre as the quantity sown, we have about 1,500,000 grains per acre. Major Hallett has counted at harvest the number of ears upon a quarter of an acre of wheat (drilled 20th of November with one and a half bushel of seed per acre, and which proved an exceptionally heavy crop of fifty-six bushels per acre), and the number of ears found was 934,120 per acre, or not so many ears as the grains sown. Here, it is evident, from the number of grains sown, that either the natural powers of tillering could not have been exercised, or that the greater part of the seed must have been sown uselessly. Doubtless some of the grains did produce more than one ear, but this only makes the case still worse for the remainder. Not only was the number of ears below that of the grains sown, but each ear was but the stunted survivor of a struggle for existence. A high authority has said that, if a square yard of thickly-sown wheat be counted in spring, and the supposed number of ears then recorded, it would be found that ninety per cent of them would be found missing at harvest. Beyond all question, in thickly-sown wheat, very many of what appear as stems in the spring die away before harvest, and have thus grown not only uselessly, but in the struggle for existence have *starved and stunted those which ultimately came to ears.*

In ordinary English crops the number of ears produced per acre being taken as about 1,000,000, and the crop as 34 bushels, we have, at 700,000 grains per bushel, 23,800,000 grains per acre, or an average per ear of only 23 to 24 grains; and, if more than 1,000,000 ears per acre be claimed, it must be at the expense of their contents. Five imperial pints (=6.1 American measure) of wheat per acre planted in September, 12 inches × 12 inches, gave 1,001,880 ears per acre, or 67,760 ears in excess of those produced on the other side of the hedge from 1½ bushel, or *more than thirteen times the seed.* Again, 6·1 pints (American measure) of wheat planted 12 inches × 12 inches, October 17th, gave 958,320 per acre; and planted similarly, October 4th, 966,792 per acre; while one bushel, planted October 15th, gave only 812,160.

Two plants of 24 ears each gave 1,911 and 1,878 grains, or 79 per ear; 20 ears per foot, at 48 grains only per ear, would produce 88 bushels per acre. All the conditions of time and space being fulfilled, we can obtain from a *single parent-grain* as many ears as are ordinarily obtained from *twenty grains*, with this most important advantage, viz.: these ears being produced from plants which have attained (or nearly so) perfect development of their growth, contain more than double the common number of grains, and their contents may be largely increased by the continued annual selection of the most vigorous parent-grains. These small quantities may be drilled on a large scale in the following manner: The object is to insure perfect *singleness* and regularity of plant, with uniformity of depth. The two latter may be obtained by the drill, as may the former also by adopting the following plan: The seed-cups ordinarily used in drilling wheat are so large that they deliver in *bunches* of grains, consisting of six or seven, which fall together within a very small area, from which a less produce will be obtained than if it had been occupied by a single grain. The additional grains are thus not only wasted, but are positively injurious. By using seed-cups which are only large enough to contain one grain at a time, *a stream of single grains* is delivered, and the desired object, viz., the depositing of *grains singly*, at once attained. The intervals *in* the rows will not be exactly uniform, but *they will be sufficiently so for all practical purposes.* The width of these intervals will, of course, depend on the speed with which the seed-barrel revolves, which can be regulated at will by adjusting

the gear which drives it. By this mode of drilling, the advantage of the "broad cast" system is obtained (equal distribution), as the rows may be close together, and the grains as thin *in* in the rows as may be desired. (1)

The crop should be hoed, as soon and a frequently as possible, with a horse hoe. If the seed has been sown early, this should be done *in the autumn*, as it causes the plants to tiller and occupy the whole ground before winter sets in. It is essential to the success of thin seeding to keep the land perfectly free from weeds during the growth of the crop.

Now, what are the advantages of Major Hallett's system? A bushel of pedigree wheat (original red) produced from single grains, planted 12 inches × 12 inches, contains about 460,000 grains, while a bushel of ordinary wheat contains 700,000 or more grains. Therefore, in two crops consisting of exactly the same number of grains, the crop from thin seeding would be upward of 70 bushels against 46 bushels per acre. Again, a bushel of pedigree barley, produced from grains planted singly, contains 390,400 grains, while a bushel of ordinary barley contains upward of 550,000, or, in two crops of equal *numbers* of grains, the one would be 55 bushels, the other 39 bushels, per acre. Thus, in the increased size alone we get and increased crop of forty to fifty per cent.

The saving of seed from such a practice is immense. The wheat area of the United States is not less than 40,000,000 acres, and the average seeding is very much higher than two bushels per acre. But, if these figures be taken as a basis, we shall not err on the wrong side. To plant grain at the rate of one berry to each square foot would be equal to 43,560 grains per acre of 4,840 square yards, or less than two English quarts. This shows that the farmers of the United States have it in their power to reduce their consumption of seed-wheat from 80,000,000 bushels to 2,500,000. Good seed-wheat ought certainly to be worth a dollar a bushel out West, and is worth very much more in the East;

(1) Thin sowing, on land in good condtion, no doubt produces the heaviest crop. The danger is, that if any disease attacks the wheat, the luxuriant thin sown always catches it fearfully, while the thicker sown only suffers moderately. The ordinary drill will plant 2 pecks to the acre with regularity, but *Newberry's diver* would drop a gallon per acre if required. I have seen in Ontario a dozen pieces of wheat covering the ground by the end of September with only a bushel to the acre. In Quebec, I should not like to sow less than 6 pecks, I confess Spring wheat not less than 12 pecks—it has no time to tiller. A. R. J. F

but on the showing, we have a possible saving of $77,500,000 in seed only for the wheat crop alone. One dollar and a half per head of the population is worth attention.

The roots of wheat sown in August become by the middle of October so developed as to render it quite safe from lifting by the frost, and attacks of wire-worm would be almost unknown. If winter wheat were all drilled by the 10th of September, the entire fall would be at the farmer's disposal for clearing the land and sowing spring crops early. The crop would not become winter proud, or be laid by the summer rains. The harvest would be from two to three weeks earlier. The harvest being over at least a fortnight earlier, would be of immense advantage in clearing land. Seasons are frequently most unfavorable to late sown cereals, but they are scarcely ever so to early-sown ones. On well-farmed lands, on the common practice, the average contents of the wheat-ears must be from 20 to 30. Were it grown on Major Hallett's system, the average contents would be, at the very least, from 40 to 60, and far more likely, from 60 to 90; for under such a system, so small an ear as one of 40 grains is quite the exception. And this increase of the *contents* of the ears

BERKSHIRE BOAR.

would be obtained without any diminution of their number; the crop, in fact, would be doubled where now fairly good farming yields 30 bushels to the acre. These promises are not illusions, since a good many men in European countries, and in the United States also, have accomplished great results in agriculture by the application of commonly accepted principles of science. Major Hallett has himself grown 216 bushels from three acres with one bushel of seed, or 72 bushels to the acre; and over a whole field 82 bushels of barley, weiging 57 pounds to the bushel, from only two gallons of seed per acre.

In reference to the point of time of sowing, it must be borne in mind that the *rate* of growth for wheat during the different months in England is as follow:

Wheat sown on	September 1st			comes up in	7 days.
" "	October 1st	In a mild autumn,	"	"	14 "
" "	November 1st		"	"	21 "
" "	December 1st		"	"	28 "

Taking this as the relative rate of wheat-growth, when it is up, then wheat which is up on the 1st of September makes in the first fifteen days of that month a growth equal to that of the whole of October; in the next ten days, a growth equal to that of the whole of November; and, in the last five days of September, a growth equal to that of the

first twenty days of December; or, in other words, wheat up on September 1st has a double autumn for a growth before winter sets in; and, indeed, the case is in reality much stronger than this, for, if winter were to set in early, there would be for wheat sown at the end of October little or no autumn growth above-ground. The importance of every day (especially the early days) of September growth can not be overrated. To illustrate this, Miss Hallett made two very accurate drawings, which her father produced publicly. They were taken on December 30th, of two plants of wheat, each from a single *grain*, one of which was up on September 1st, the other on September 19th, and had thus lost the growth (after having come up) of the first nineteen days of September, the development of the earlier being double that of the later. These facts clearly point to the necessity of sowing in August. Nature, too, in shedding the grain it August, seems to indicate it as the proper time, or rather as a not unfit time, or the species would not be perpetuated. Within the present century it was the custom of many English farmers to go to wheat-sowing whenever it rained during harvest. (1)

conducted between the end of August and the 10th of September, at the rate of two to three gallons per acre; for each week later to the end of September, a gallon extra. When observing the unimpeded growth of cereals, there is seen to exist a striking variation in their modes of growth and powers of production. The superiority of some individuals over others is so marked in various ways as to lead irresistibly to the conclusion that it must be hereditary, and on this fact the whole argument for selected seed-grain rests.

Let it not be supposed, from what has been stated, that the use of artificial fertilizers is sought to be prejudiced. On the contrary, if improvement can be secured without them, it will be immensely greater when aided by them. But, while the purchase of good seed of pedigree stock in small quantity, though the farmer bought it at six dollars (Major Hallett frequently obtains five), would be a very economical proceeding, if he does not use more than two gallons, the cost of which would only be one dollar and a half per acre; the buying of common seed at one dollar, and using two to three bushels, involves a greater outlay. Therefore, in proposing this reform, it will be seen that it does not mean spending

BERKSHIRE SOW.

In determining the *space* to be assigned to each grain, we must deal with seed the result of continued selection, for the vital powers of the different grains of ordinary wheat are so *very* unequal that it would be impossible to fix upon any uniform distance. In planting grains of wheat in August, singly and twelve inches apart each way, all the requisite conditions of time and space seem to be best fulfilled, as will be seen further on. Wheat has been planted September 9th, 9 inches × 9 inches, and produced at the rate of 108 bushels per acre. It must be borne in mind at all times that it is a matter for mature study and judgment to correctly apportion the quantity of seed to the time of sowing, *and to all the existing surrounding circumstances.* A large quantity of seed sown early, is just as much opposed to reason as a small quantity of seed sown late, and in fact more so, as in the first case it will become winter-proud and can not succeed, while the season may be such as to enable the latter to do so. As a general basis, the drilling of wheat on a large scale might be

(1) In 1850, it was the custom in the South of England to begin wheat sowing about the 15th of October, except on the Cotswold hills, a bleak spot, where the new wheat in stack in one field was neighbour to the "braireding" wheat in the next. If the winter was mild, the sheep were turned in sometimes as often as 6 times in a season.
A. R. J. F.

more, but less, on seed. The weeding, if done properly, may cost two dollars per acre; and if, after this, the grower has any money to spend on fertilizers, let him invest it by all means. As a general rule, it may be confidently asserted that what would be saved in the outlay for seed would pay the cost of horse-hoeing.

Considering how rapid is the improvement of the process of selection during the first five years, its effect on the wheat-crop of the country would be enormous. If we take 500,000,000 bushels of wheat as the present product (which is much less than it is), than doubling the crop and adding at the very least fifty per cent improvement in quality to the grain, we should obtain an increase of about $750,000,000, without bringing an additional acre into cultivation. I have not said much of the effect on the corn-crop; but on a crop of 1,750,000,000 bushels, at an average value of 38 cents, it would, if but fifty per cent increase in five years could be realized on 27·5, be astounding. To-day, the area in corn is not less than 65,000,000 acres; 12·50 bushels increase, at 40 cents per bushel, would be five dollars an acre, or $325,000,000: $1,075,000,000 of additional food in the short space of five years would give a new impetus to the milling trade in this country, and the hog-business would grow with a rapidity out of all proportion to its past career. Neither

steel nor electricity can promise anything so great in so short a time, and no reform accomplished in this century will be able to measure this one.

Who will be the first to carry out such a scheme? In the Washington Department of Agriculture and in several other parts of the country, pedigree cereals have been used, but the results have not been taken much advantage of. The experimentalists of the State College farming-stations are especially qualified to lead in so important a work. The time is not far distant when intensive rather than extensive culture must be the rule of American farming. Already, in the East and in the South, men are finding it pays better to cultivate 100 acres well than 300 acres carelessly. When the hunger for large areas abates, we may hope to see attention paid to better cultivation. The toil and misery, disappointment and mortification, of skimming broad acres for meagre results must give place to farming for profit. The change, when it comes, will be aided to some extent by professional guides and public men, but the foundation for it is within. The farmer is a near neighbor of hard facts, and living in days when everything is questioned, and nothing is taken for granted—when every institution in the land has to make good its claim to existence by the results produced—he is not likely to be deceived, or to grab any longer at the shadow for the substance. His wealth and happiness consist not in the number of his acres so much as in the principles of his farm practice. He will discover, as many of his *confrères* have already done, that the future of American agriculture will be determined by the extent to which fundamental truths of science are applied. (1)

OUR ENGRAVINGS.

Cuts to illustrate the article on drainage; v. p. 57.

Berkshire Boar and Sow.—

A crupper strap for an unruly bull.—

We have found the method shown in the accompanying cut, to answer perfectly when properly applied. A new piece of three-quarter-inch rope (C) is securely fastened to the ring in the nose of the bull and passed between the horns and along the back, and made fast around the tail, like the crupper of a harness. This rope is pulled tight until the nose of the bull is raised high in the air. A surcingle, or belly-band (B), made with a broad strap having a slot or ring (E) on the back for the rope to pass through, is firmly buckled around the waist of the bull. A strap (D) is buckled round the horns and over the rope to hold it in place. The staff (A) is then attached to the ring in the nose, and if everything has been properly done there will be no danger.

The point which is to be enjoined is to see that the bull's nose is drawn as high in the air as it can be, and no mistaken idea of its being cruel should allow of its being half done, for it is only by lifting his nose high in the air that he is prevented from using his horns. A very new rope is liable to stretch, and therefore a good strap is better, and it may be shortened or lengthened at pleasure. The whole process is similar to the use of the check-rein on a horse and is no more painful to the bull, while its use, of course, is only temporary. *Rural New Yorker.*

Crop report; Georgia.

OATS

"Have not yielded as well as last year, nor was the area sown to them so large. The quality of the grain, however, is generally superior, though the straw has been short on account of the spring drought. The yield compared to an average is reported in the whole State, 87; in North and Middle Georgia, 89; in Southwest Georgia, 83; in East Georgia, 80, and in Southeast Georgia, 85.

The average yield per acre this year, in the whole State, is 14.5 bushels against 19 last year. In North Georgia the average yield is reported 17 bushels; in Middle Georgia, 15; in Southwest Georgia, 12; in East Gorgia, 11, and in Southeast Georgia, 14 bushels.

WHEAT.

The yield of wheat in the State, compared to an average crop, is 88 per cent; in North Georgia, 81; in Middle Georgia, 88; in Southwest Georgia, 91; in East Georgia, 94. None is reported in Southeast Georgia.

The average yield per acre in the State is one bushel less than last year. It was 8 bushels last year and 7 this. The yield per acre in North, Middle, and Southwest Georgia is 7 bushels, and in East Georgia 6 bushels. None reported in Southeast Georgia. The wheat has, with the exception of a few counties in North Georgia, been free from rust or other casualties, except the injury from freezes during the winter, and consequently the quality is generally good."

Georgia does not seem, from the "crop report," to be in a very prosperous state. Seven bushels (Winchester) per acre can't pay, neither can 14 bushels of oats.

A. R. J. F.

(1) There can be no harm in trying the experiment on a moderate scale, though when I remember the magnificent barley which the Essex men used to grow with seed from the fens of Cambridgeshire, their own barley being always sold for malting, and the fen barley being "chicken-victuals," I cannot help thinking that quality of soil and judicious cultivation are more influential than pedigree. But then I am an old fogy. A. R. J. F.

De omnibus rebus.

CRIB-BITING.

I see that a question concerning this vice is asked in the *Journal d'Agriculture* for June. I know of no cure, after the habit is confirmed, but a strap buckled as tightly as possible, without stifling the subject, round the neck at its junction with the head will be found useful in checking the practice. In all well managed English stables, the cry from the groom, "got at cribbing?" i. e. "what are you (the horse) doing, gnawing your manger?" is constantly heard, and prevents the commencement of the habit. It is a breach of warranty to sell a crib-biter or wind-sucker as sound. I have never seen a horse troubled with this vice since I have been in Canada.

Taste of wool in mutton.—A very erroneous expression for a very disagreeable sensation. The horrid flavour arises from not emptying the sheep of its entrails immediately after death. A sheep should fast for 24 hours before being slaughtered, and be emptied at once.

Why does the hind-shin of a bullock make better and stronger soup than the fore-shin, weight for weight? I wish our butchers would cut up the cattle in a different way. The two joints, "rump" and "aitch-bone," are unknown here. Why *aitch?* A *saddle* of mutton, i. e. the two loins, cannot be had, my butcher tells me, because the slaughterers at the abattoir persist in breaking the sheep's back. The difference between the flavour of a saddle and a loin is not to be expressed in terms; and if the widest part (the ribs) is cut straight across into double chops an inch thick, and *quickly* broiled, the writer will be thanked by the eater, and the remainder of the joint will not be found too large for a small family.

Crops in England.—I have flaming accounts of the state of the crops in England. The weather seems to have been all that could be desired. Poor farmers, they have had a

turn of good luck at last! The acreage of fall-wheat is not as large as usual, but the other grain and the pulse crops are splendid.

Crops in the United States.—It is difficult to arrive at the truth about the condition of the crops in the States; lies upon lies are told in the reports for commercial purposes. California alone is said to have 1,000,000 tons of wheat to spare, or 33,333,333 bushels! Which statement, the proverbial Jew, Apella, would not believe.

Crops in Quebec.—On the light lands the crops of all kinds are doing well. I hear of 2½ tons and 3 tons per acre of new grass every day. On the heavy lands, I regret to say, the reverse is the case. The Montreal Star of July 10th states that the rain-fall of the last 3 months has not been greater than usual. All very true, no doubt, but the land was never dry, and the crops were sown late. I am afraid for the clays.

Failure of the Clover-plant.—Boussingault, the French agricultural chemist, suggests that the failure of the clover-plant arises from the exportation of the products of the farm. "If," says he, "the fodder is consumed on the spot, the greater part of the constituents of the plant will return to the manure after passing through the cattle; and as a clover-crop takes up 77 lbs of alkali per acre (potash and soda), the food of clover will be always at its orders. It will be quite otherwise if the fodder is taken to market; and it is to the repeated exportations of the produce of artificial grasses that the failure of clover, as observed in soils which have long yielded it in abundance, is undoubtedly due."

This won't do at all. In the Eastern counties of England, clover fails if sown oftener than every third rotation (12 years), and, there, nothing but grain, pulse, meat, and milk is exported. Tons upon tons of cattle food and and artificial manures are imported; and yet the clover fails on repetition. The cause of its failure seems to be mechanical: the land becomes too loose to hold the roots. Boussingault recommends potash, wood-ashes, or soda: Lawes can find *no* manure for clover.

Liebig admits that the *physical* conditions essential to the fertility of a soil are usually neglected in the calculations of the chemist; and the fact that, in the fine soils under the chalk hills of Sussex no good crop of wheat can be grown after vetches, unless a crop of rape or turnips, fed off by sheep, intervene, shows the importance of the point in question. "The sheep-fold brings gold", is an old and true proverb in my part of England.

I am constantly having it dinned into my ears, that there is no manure like farmyard dung. Well, nobody denies it. The question is simply this: have we enough farmyard dung to dress our land with as it ought to be dressed? We all know that we have not. Then why not use such assistance as the various special manures, artificial and natural, afford us? Bones, sulphate of ammonia, and nitrate of soda, bought of trustworthy dealers and added to our home supplies, will never deceive us.

We all let our grain crops stand too long before cutting. Mr John Hannam, North Deighton, Yorkshire, tried several experiments on the proper age for reaping grain-crops, with the following results as regards wheat:—

N° 1, cut *quite green* on 12th August, gave a return per acre of	11 17 0
" 2, *green*, 19th August	13 6 0
" 3, *raw*, 26th August	14 18 0
" 4, *not quite so raw*, 30th August	14 17 4
" 5, *quite ripe*, 9th September	13 11 8

Hence, a loss of 1 14 8 per acre on n° 1 compared with n° 5.
" " 0 5 8 " " " 2 " " " 5.
A gain of 1 6 4 " " " 3 " " " 5.
A gain of 1 5 8 " " " 4 " " " 5.
A gain of 3 1 0 " " " 3 " " " 1.

Wheat reaped two weeks before it is ripe gives an advantage in every point, viz.:

In weight of gross produce	13½ per cent.
" equal measures	½ "
" equal number of grains	2½ "
In quality and value	3½ "
In weight of straw	5 "

The last item, weight of straw, I should have expected to have shown a higher percentage. Mr Stephens, in arguing this question in his "Book of the Farm, says: "Upon one occasion I cut down a few shocks of potato-oats when quite green, though full in ear, to allow carts to pass to a place destined for the site of a hay-stack, and after standing till the rest of the field was brought in, they were threshed with the flail by themselves, and the sample was *the most beautiful grain I ever saw.*"

A baddish season for the *vineyards*, I fear. Heavy rains and much wind at blooming time must have done great damage. I hear nothing about the sugar-beet industry this year. Can any one tell me how it is getting on? Pretty expensive work, hoeing beets with wages at $40 a month! I hear that Ferguson's and the Longueuil vineyards are doing well.

Devonshire butter.—The albuminoids of milk embrace two constituents of similar composition, casein and albumen. Casein (cheese) is not coagulated by boiling, but albumen is. At 134° F., albumen begins to show flakes in the liquid in which it is heated, and at 160° F. it becomes solid; so that, in the manufacture of Devonshire butter, it is not necessary to heat the milk higher than the latter degree. Still, as the heat is never equal all over the pan, and as stirring to equalize the temperature is not admissible here, I should be tempted to warm up to 170° F. If a thermometer is used, it should be inserted before beginning to heat the milk, and placed in the middle of the pan half-way down the depth of the milk.

OXEN V. HORSES.—An experiment was tried some years ago as to the relative value of horses and oxen for agricultural labour. The oxen ate 250 lbs of turnips a day, each! Each horse ate 16 lbs. of oats daily; both having oat-straw *ad lib.* The conclusion arrived at was, that, on farms, horses should be employed exclusively.

SHEEP IN 1844.—What a wonderful difference in the price of mutton in 1844 and 1883! "Hampshire Down ewes are kept on small farms for producing early lambs for the London market, and the ewes themselves are also sold fat in the autumn; the average cost of the ewes per head being about 24s.; the return, including lamb and wool, from 50s. to 55s. *Baker of Writtle*, 1844. Now, the ewes, *broken-mouthed* or *crones*, i. e. old ones, would cost from 60s. to 65s., and the return would be something like this; fat lamb, 5 stone, at 8s.=40s.; ewe's wool, 6 lbs., at 10d.=5s.; fat ewe, 12 stone, at 6s.=72s.; a total of £5. 17. 0; more than double.

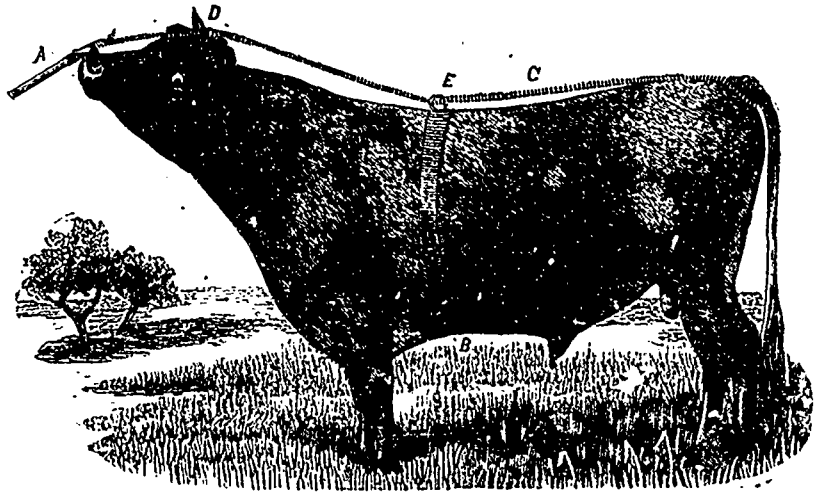
The cause and physical action of dew were little understood before the experiments of Dr Wells, in 1814. Before

that time, the formation of dew was supposed to be the *cause* of the cold observed with it, and he, originally, entertained the same opinion.

"But," he says, "I began to see reason, not long after my regular course of experiments commenced, to doubt its truth, as I found that bodies would sometimes become colder than the air, without being dewed; and that, when dew was formed, if different times were compared, its quantity, and the degree of cold which appeared with it, were very far from being in the same proportion to each other. I came, at last, to the conclusion that dew is the production of a preceding cold in the substances on which it appears; and that the cold which produces dew is itself produced by the radiation of heat from those bodies upon which dew is deposited."

The formation of dew not only does not produce cold, but, like every precipitation of water from the atmosphere, produces heat. As the earth becomes colder than the atmosphere on dewy nights, by reason of a radiating energy, and as the moisture suspended in the latter possesses the atmospheric temperature, dew, with respect to the surface of the earth, is warm. Were it not that this antagonistic warming process counteracts, on cloudless and serene nights, the rapid escape of heat from the earth by radiation, it is probable that the temperature of the soil would be depressed, during the sun's absence, by a greater amount than it is elevated during its presence; and that the extremes of heat and cold, during the 24 hours, might be so great as to destroy vegetable life in the summer season. The least experienced observer may easily satisfy himself of the superior cold of the earth's surface, and clear nights, relatively to that of the atmosphere. Hoar frost—frozen dew—frequently forms on grass when the thermometer in the air indicates a temperature some degrees higher than the freezing point, 32° F. This phenomenon shows that the earth, or the leaves of plants, were colder than the atmosphere, and below the freezing point, when the deposition of dew took place. Hence, buckwheat is often destroyed by frost, when the suspended thermometer has not fallen below 45° F. during the night in which the damage was done.

There will, I fear, be an immense quantity of inferior hay this year. The young seeds, clover principally, were all laid by the heavy rain, and farmers, dreading the weather, were induced to let them stand too long before cutting. A long experience has taught me that when grass is ready it should be mown. When green, clover and other grasses will stand lots of wet with very little damage; but when fully ripe, a heavy crop, such as was commonly to be seen this year, is ruined past redemption by one heavy shower. I saw plenty of clover, which was fit to mow on the 25th of June, laid, kneed-down, and still uncut on the 18th of July. Bad, mouldy hay should never be given to horses. If, unfortunately my readers have any, I counsel them to cut it into chaff, sprinkle it with a mixture of a quarter of a pound of linseed (crushed) in a gallon of boiling water, with a little salt, for each head of stock, and give it to their cattle. They will eat it, then, at all events, though it won't do them much good—oat-straw, cut greenish, is much better for them. The hay-crop is a very pretty thing, and suits lazy people exactly; but I think some of us depend too much upon it. There ought to be a good second cut of clover by the end of August—cut it as soon as it comes into bloom.



A CRUPPER STRAP FOR AN UNRULY BULL.

ACIDITY IN LAND.—I remember perfectly well that, in the early days of superphosphate, a correspondent of the English Royal Agricultural Society's Journal grew a fair crop of turnips with no other manure than dilute sulphuric acid! I cannot lay my hands on the passage at present, but I will try to find it in the library of the Montreal Natural History Society. By the bye, it is rather curious that the whole series of R. A. S. Journals contained in that collection should be uncut!

RADIATION.—Professor Huxley lately gave some experiments in a lecture to the Royal Society in London, to show the difference in temperature of the air and the surface of the earth. Two stout poles were fixed firmly in the ground eight feet apart, and a cord stretched between them. From the centre of the cord a thermometer was suspended, with its bulb four feet from the ground, on the earth was placed a pad of cotton wool, and on it a second thermometer, the object of the arrangement being to determine the difference of temperature between the two thermometers, which were only four feet vertically apart:

SKY CLOUDLESS; HOAR-FROST; WIND LIGHT, FROM N. E.

Time.	Air.	Wool.	Difference.
6 50 A M.	31° F.	25° F.	6°
7 20 "	32½	24½	8
7 40 "	34	25	9
7 P. M.	35	26	9
7 30 "	35	25	10
8 30 "	34	24½	9½
9 40 "	33	24½	8
10 20 "	32	24	8

A. R. J. F.

Practical Farm Drainage, by C. G. Elliot, Drainage Engineer. Indianapolis, Ind. 1882.

Though this little book treats principally of the drainage of *prairie-soils*, I do not hesitate to say that it will be found a great help to any one who intends to embark on the most effective of all land improvements. I find little or nothing stated in the work with which I disagree, and the information is given in very clear shape.

"Open drains (ditches) are simply an aid to natural drainage, acting principally upon the upper six or eight inches of soils. Late in the summer, if the season is dry, the lower soil will be found partially dry, but generally it never becomes well drained except at the surface. We must have ditches, but they should be regarded only as necessary accessaries to under drains."

TILE DRAINS.

"The good effects of drainage previously mentioned cannot be brought about by a system of open drains, only as such a system is constructed for the purpose of affording sufficient outlets for under-drains. In observing the process of natural drainage as shown in fig. 4, we see that such drainage is very slow, since it depends upon the nature of the soil and the relation of the contour of the sub-soil to the surface. Open drains are simply an aid to natural drainage, acting principally upon the upper six or eight inches of soil. Deeper than this, the soil, during the spring-time, is tough and compact, scarcely allowing the plowshare to cut and turn it to the surface, because of its adhesive nature. At the same time, a few inches of the surface soil which has been surface-drained and acted upon by the sun and air, will be friable. Later in the summer, if the season is dry, the lower soil will be found partially dry, but generally it never becomes well drained except at the surface. We must have ditches, but they should be regarded only as necessary accessaries to under-drains, if we wish to realize their full benefit. A tile-drain, in order to accomplish its purpose perfectly, should possess the following requisites:

It should consit of pipes of sufficient size, laid at proper depths, to carry away all water which may come to them.

Each line should have a perfectly free outlet.

The pipes should have sufficient space between them at the ends to permit water to enter.

Each separate line should be laid on an incline, or series of inclines, of regular grade.

The tiles should be of good material and well-burned, in order to be a permanent improvement."

Perfectly true, as to clay soils, the running water *puddles* the bottom of the ditch, and prevents the drainage water from rising into it. In a gravelly, or moory subsoil, however, this is not the case: I have seen, in Berkshire, Eng., blocks of 10 acres each, in a soil of the latter description, perfectly dried by ditches 4 feet deep all round the pieces.

How water enters a tile (pipe) drain. Fig. 1.—This little cut shows the way in which the water of drainage enters the drain.

HOW WATER ENTERS A TILE DRAIN.

"A correct understanding of this will help us to determine the best way to make the joints, and also to locate the lines as regards their distance apart. The tiles should have their ends joined as closely as the inequalities arising from moulding and burning will admit of. When this is done, there will yet remain sufficient space for the water to pass in or out, but not enough to admit soil, except in the form of very fine silt. At the bottom of the drain and nearly on a level with either side of it, the earth is saturated with water, that is, it can hold no more. The plane forming the upper surface of this saturated earth is called the water-table. Figure 1 shows a cross-section of a drain, the curved line AB representing the water-table, or line of saturation, the darker part of the figure representing the saturated earth, and the lighter portion above the water table the drained soil. When rain falls upon the surface it descends directly downward by the force of gravity. When all the particles of the drained soil contain all they will hold by absorption, the water passes down until it reaches the saturated soil, when, as it can go no further, it saturates the lower portion of the drained soil, thus causing the water-table to change its place and rise higher. As the water-table rises, the water rises through the joints of the tiles, and they being inclined, a flow begins and continues until the water-table recedes to

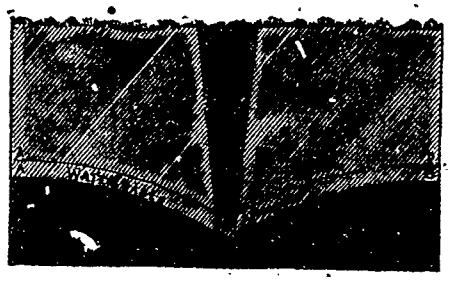


Fig. 1.

the floor of the drain, when the flow ceases. It will be seen that the water-table will vary in height with the quantity of drainage water in the soil. When the water-table rises to the top of the drain, the tile will discharge a stream as large as its calibre. If the water-table rises higher than this, additional head is given, and the velocity of flow is increased, but the depth of drained soil is decreased. The fact that the tiles are porous does not increase the flow or add to their draining properties. They would be as suitable for draining purposes if made of glass, or of glazed ware, as when made of porous clay, for they will be taxed to their full capacity by water flowing into the joints. The water-table does not extend on a level indefinitely on either side of the drain, but rises as it recedes, the angle of rise varying with the nature of the soil. This fact will be alluded to again in the discussion of the distance apart of the drains."

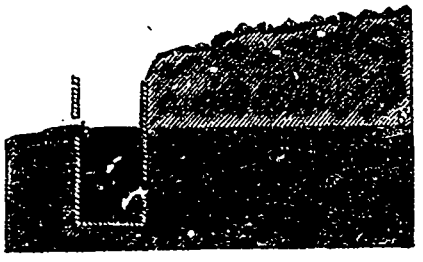
A better description could not be given. It puts an end to the absurd idea of a drop of rain hunting its way between clods of earth, and at last trickling into the drain. Gravity does it all, and no water enters the pipes until the whole body of earth up to the surface has received as much water as it can hold.

As for the depth at which drains should be laid, we must not forget that, after drainage, air takes the place of the surplus water. The inert soil matter is slowly changed into plant-food, making the whole depth of drained soil the natural home, or feeding ground, of the roots of plants.

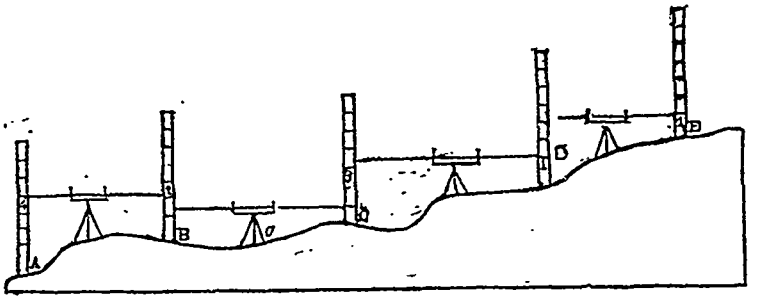
"I have often been interested in noting the ideas most

people have as to how far and how deep the roots of plants extend. The majority guess roots of grass and clover penetrate between five and ten inches, and are surprised to find that hey reach several feet. I have some roots of timothy, clover, and other plants, dug from a very heavy clay soil, a good quality of brick clay, so compact and hard that a sharp knife, in cutting it, leaves a surface as smooth and shiny as it would cut on the end of a pine board. I have traced the roots of the timothy to a depth of two feet and four inches, and the clover three feet and two inches. A number of years ago a very intelligent German farmer, named Schubert, made some very interesting observations upon the roots of plants as they grow in the field. An excavation, five or six feet deep or more, was dug in the soil so as to leave a vertical wall. Against this wall a jet of water was played by means of a garden sprinkler: the earth was washed away, and the roots of the plants growing therein laid bare. The roots thus exposed in a field of rye, in one of beans, and in a bed of garden peas, presented the appearance of a mat or felt of white fibers, extending to a depth of about four feet.

"Roots of wheat sown September 26, and uncovered the 26th of April, had penetrated three and a half feet, and six weeks later about four feet, below the surface. In one case, in a light subsoil, wheat roots were found as deep as seven feet. The roots of the wheat in April constituted forty per cent of the whole plant. Hon John Stanton Gould, I believe it is, says that he "has seen the root of Indian corn extending seven feet downward," and Prof. Johnson states that "the roots of maize, which in a rich and tenacious earth extend but two or three feet, have been traced to a length of ten or even fifteen feet in light, sandy soil." Roots of clover, when growing in a rich, mellow soil, extend far, both laterally and vertically. Prof. Stockbridge "washed out a root of common clover, one year old, growing in the alluvial soil near the Connecticut river, and found that it descended perpendicularly to the depth of eight feet." Lucerne roots are stated to reach a depth of twenty and even thirty feet. Alderman Mechi, in England, tells of a neighbor who "dug a parsnip, which measured thirteen feet six inches in length, but was unfortunately broken at that depth."



Cut 2.



Cut 3.

THE NEARER 4 FEET DEEP THE PIPES ARE LAID, THE BETTER.

Cut 2 shows a faulty outlet, and needs no description.

Levelling is too often neglected. No one, however, who wishes to do draining-work to the best of his ability, should omit it. The practised eye and hand of men who, like some of our English drainers, have passed thirty or forty winters at this job, may generally be trusted, but even they sometimes make mistakes. *Cut* 3 shows the process in a very practical manner. I tried to describe it in words in my articles on drainage in the Journal for December 1880, but I left off with a horrible sense of failure. Let Mr Elliott try:

"For convenience in leveling for drainage purpose, we begin at the place which we consider the lowest point upon the farm or field, and make a preliminary level survey in order to find the elevation of the lowest portions of land requiring drainage, and the distance of such places from the common outlet. We assume the the starting or outlet point at the surface of the ground to be 100 feet above an imaginary plane below called the *datum plane* or *datum*. Place the instrument at some convenient distance from this point (the distance will depend upon the power and accuracy of the instrument), take a reading at the point A. fig. 8, which we will assume for illustration to be four feet; add this to the assumed elevation of A, and we have 104 feet, which is the height of the line of sight or of the instrument above *datum*. Now take the rod to B, and take a reading, which we will assume to be two feet. Subtract this reading from the height of the instrument and we have 102 as the elevation of the point B. Change the instrument to some place beyond B, as at C. Take another reading at B, called a backsight, or commonly a *plus* sight, which we will suppose is 1.5 feet. Add this to the elevation of B for the height of the instrument in its new position, which is 103 5 feet. Take a reading at C. which is one foot. Let these operations be repeated until the elevation of all points desired is found. Observe, that at every change of the instrument a back-sight must always be taken upon the last point at which a reading was taken, and its reading added to the elevation of that point for a new height of the instrument. Also subtract every fore-sight reading from the height of the instrument, to obtain the elevation of that point.

Cut 4 presents a good outlet, built of stones or brick, the pipe is divided by a wire passing through holes drilled in the tile to prevent the entrance of vermin.

"*Junctions* of the main and small drains should always be at an angle as nearly 30° as possible. If a greater angle is necessary, the mouth of the branch tile should be curved" cut 5. This and most of the other points were fully treated in my articles on drainage before mentioned, and I have nothing to add to what I said there.

ARTHUR R. JENNER FUST.

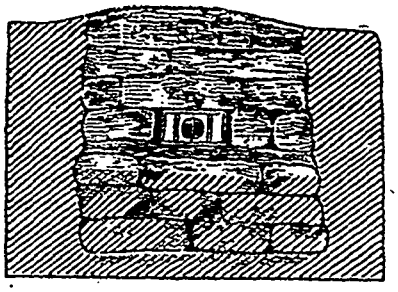
THE CULTURE OF SHEEP.

GEN. CASSIUS M. CLAY.

Feed and Water.

IT is useless to attempt the culture of sheep without grass. Sheep are generally said to be costive. This is the case only in large areas where water is scarce and the grasses dry. The intestines being long, on dry food the moisture is exhausted before the excretions are voided. But I find when my sheep are in the finest state of culture they are no more costive than cattle or horses. Sheep will go longer without water than any of our other domestic animals because as they always prefer the young, juicy grasses and weeds, there is more

water taken into the system in their case than in that of other stock in feeding. But sheep, if allowed, will water each day as regularly as cattle or horses. The constitution of the sheep is, however, adapted to tender, juicy grasses, and hence in England, a moist country and full of grasses and succulent roots, the sheep have attained an improvement which can only be rivaled in such places as this, where the sheep graze all the year round. In the North, where grass fails in winter, roots, such as turnips, beets, etc., should be fed every day with hay, straw, fodder and grain, or whatever, else is used. But here they will paw away the deepest snows and graze, and only need a little grain and hay when the grass is weakened in nutriment by excess of cold. For nearly thirty years I have eaten sheep in every season thus fed, and always find them fat enough and at times too fat, even in winter. There is quite a rage now about siloes and ensilage; but I am not at all convinced that this system is practically useful. It was no doubt known to the ancients, and its disuse seems to be an argument against it. I am of the opinion that dry corn-fodder cut, even in the North, very fine and fed with beets, grain and cotton-seed, or oil-cake or turnips, will be *cheaper* and more wholesome than any ensilage. I give my opinion. I have never tried it, and I never will. I have known many sheep lost by feeding whole grains of maize *in bulk* to sheep. Hence, my father was in the habit of sowing this grain broadcast to his sheep; and I have



Cut 4.

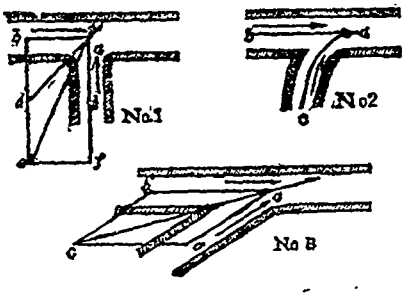
followed his example. They will in a few minutes pick up their rations of a gill or a half a gill as quickly as a chicken. But when eaten in bulk, instead of chewing each grain, they will swallow it rapidly, and colic or diarrhea is the consequence. When corn is fed in barns and troughs, the grain should be ground into meal or grits, and if some hay or ground cob or other "roughness" were mixed with it, so much better would it be.

THE DISEASES OF SHEEP.

Anyone looking into English works upon the diseases of sheep would be deterred perhaps from their culture. The sheep has a small brain and weak nervous system, and in consequence yields readily to disease. It has therefore been my study to avoid diseases, especially here. The consequence has been that to me almost all the diseases of sheep are practically unknown.

The rot, the scab and the foot-rot, the most formidable diseases of English sheep-culture, are to me strangers. The sheep-fly, at times, kills two or three per cent of my flock, and other seasons more. This fly, like the Œstrus bovis to cattle, is a great nuisance to sheep. As soon as the weather gets warm the fly attacks the sheep, feeding on the mucus of the nose, and laying its egs there. After it has gone through the larval state it falls to the ground, and there rests as a chrysalis till spring, when it comes out a fly and again attacks the sheep. Some of them making their way into the interior bones of the head, enter the brain, and late in the winter kill the sheep. I have cut them from the brain as large as an ordinary peach borer, say three-quarters of an inch long, thicker, with a similar head and body. It has been said that coal-oil poured into the nostrils after the symptoms appear such as stupidity, vertigo, and standing without apparent motion in one place, will kill the larvæ, but I have never succeeded in curing a sheep. These flies seem to run the sheep almost mad, and they will lie a long Summer day huddled together without moving or feeding; at night, they venture out. Whenever I catch my sheep I put pine-tar on the nose and face, and as long as this lasts I think it a security against the fly. The same remedy is used by putting the tar about salt troughs so that their noses touch it. No doubt tar is good, but the loss is so small that I don't care to worry myself and the sheep about the fly. Sometimes the sheep's foot grows into too long an outer hoof on soft grounds, when it must be trimmed with a sharp knife, but not to the quick. I don't find it necessary to wash my sheep with tick cures. Fat is a sovereign remedy against vermin, though I make the shearer kill what few ticks are seen; and I put sulphur in my salt troughs in the early spring, when they begin to rub themselves.

By putting on bells, a size between the ordinary sheep and cow-bell, in the proportion of one bell to every five sheep, I lose but few sheep from dogs. Sheep-killing dogs are generally timid, and the great clatter of the bells alarms them; and in reasonable distances the master can come to the rescue



Cut 5.

with the shotgun. It is a good plan also to put cows with young calves among sheep. They will attack any dog that appears and run him off. If all else fails, they may be poisoned with strychnine, or caught in pens gradually sloped and open at the top like the old-style wolf-pen. But after all, my principal loss, as great as all others put together has been that the South Downs, being short-legged and very broad on the loin, get on their backs and, unable to turn over, die. When the editor of the Indiana Farmer, who visited me over a year ago, was told of this, I saw an incredulous expression on his face; so without ado, I sent for my shepherd and asked him about the fact, which he at once proved. As the value of the South Downs has improved of late years, I have adopted the rule to have the shepherd visit them all once a day, count, and turn over those lying on their backs. (1)

This last year I lost for the first time several of my lambs of 1882—none of my old sheep being affected—although I turned them together after the young ones began to die. I was told that it was probably the rot, but turning to a full treatise on that subject I found no symptoms of that disease, especially no flukes in the liver. The sheep ate well enough, but dwindled in flesh, and in a few months died. On dissection I found all things normal, but some small pimples on the lower intestines; so I attribute it to malaria, similar to typhoid fever in man. The summer was unusually wet, and my lambs I found, being separate, had kept under one tree all the season, for I had failed to move them in the pas-

(1) I should think so! A. R. J. F.

ture as they were well divided into groups ; I had with them few cattle and great abundance of grass. The disease, however, ceased in the fall, and some that were emaciated have recovered their usual flesh. I have thus named all the ills of sheep that have come under my obse vation, and attribute my exemption from disease to the peculiar climate, soil and breed , for the South Down is no doubt the most hardy of sheep, and salt and ashes are great aids to health. *Country Gentleman.*

Steaming Food for Cattle.

LETTER FROM MR. CROZIER.

EDS. COUNTRY GENTLEMAN.—I am in receipt of your fa or of Jan. 23d, and in reply to the questions you enclose, I beg to say I have not steamed any feed for cattle for the past three years. I still steam for my hogs and horses. I grow large quantities of corn fodder, cut it green, and put it up in large stooks in the field until it is cured ; then it is hauled to the barn and put by for winter feeding. It is cut up in half-inch lengths, also the same quantity of peas and oats, say ton for ton. These are mixed with a ton of pulped mangolds, 400 pounds of bran and 400 pounds of ground oats, and a little cottonseed meal and salt. The whole is thoroughly mixed and left until it commences to heat a little. Then each cow gets one bushel basketful night and morning, and afterward each cow gets peas and oats.

My experience in steaming is that it produced more milk —in fact it strained the cows too much, and the calves when dropped were not so strong as they are on the feeding now given. I know that we get more butter now than I did while steaming. Last season, from January 1882 to January 1883, I sold 9,100 pounds of butter from 32 cows, and would have done better but for the very dry, hot summer we had here. During the season of 1881 I made 9,540 pounds of butter from about the same number of cows. Were I selling or making milk for market, I certainly would steam all the food for the cows, as it increases the milk record, I think, some 15 or 20 per cent. It is to get the most butter with the least expense that I now feed cows; as I depend entirely on butter to meet my bills, which it has done up to the present time.

ONIONS.

"An onion is the most vilified and worst traduced esculent there is, and yet it is one of the most delicious, to some persons,that the earth produces. There is one thing that it lacks, and that is popularity. I know men who, if they experience the slightest whiff of an onion, become so sick that they are in the deepest imaginable misery for hours thereafter. What I say is no exaggeration in the least. Assistant Prosecuting Attorney Hooper is afflicted that way. On the other hand there are those who are so passionately fond of onions that they would rather eat a mess of onions than to sit down to the finest banquet in the land General Samuel F. Hunt, of Ohio, is one of them. General Hunt is an enthusiast on the subject of onions. He told me once, that every time he visits the residence of a friend of his,who makes a specialty of raising a particularly fine species of onions, he eats so many that he is ashamed of himself. Many a time he slips off to a restaurant, and enjoys a feast of his favorites in several courses. He says those are the happiest moments of his life. To the traveling man, the onion is the best friend in the world. You can't think of any shape that an onion is not good in: boiled, stewed, fried, baked, fricassed, escalloped, roasted, pickled or raw, they are palatable and delicious. Cooked with potatoes, beefsteak, turkey, or duck, they are exceedingly savory. Just let a fellow banging around the country, disgusted with the fare he receives at out-of-the-way hotels or boarding-houses, eat a raw onion, and see how it will brace him up. If you have taken too much tea of an evening, and feel the worse for your bout the next morning, manage to get outside of an onion or two, and see how it will help you. Onions are excellent cures for heavy colds, as everybody knows. Then, when a fellow becomes wakeful, just let him fill up on nice sliced onions. Gracious to goodness, what a comfortable drowsiness will come over him ! He forgets all care, and sinks into a regular old-fashioned, forty-knot snooze that does him a power of good, I tell you. " *Poultry Journal.*

Onions are good, there no doubt about it. Many a time have I gone down into the country in the middle of the London season to eat them, always allowing a blank day to elapse before my return to town. Spaniards and Portuguese live upon onions, almost, and a genuine Welshman will eat you half a dozen at a meal ; not mild, tame things like ours, but pungent potato-onions, the very smell of which as he cuts them,or rather champs them with his teeth,has often brought tears into my eyes. If any one desires to know to what degree of perfection stench may be brought, let him go to the gallery of any theatre in Spain or the South of France, and thecombined odours of onions and garlic will—faugh !

A. R. J. F.

(1) Precisely my idea. A. R. J. F.

Saving Manure in Summer.

There are different modes of saving manure the materials for which accumulate on the farm. The common or careless farmer throws out the clearings of his stables, and allows his cattle to run in the yard, their droppings and the stable manure being washed away by rains, and all the liquid portions wasted, except such as may be accidentally absorbed by the straw and litter. Others, more careful, secure the liquid manure by means of gutters in the stable floors, or by the use of enough litter and absorbents to prevent its waste. If much straw is employed, the manure heaps are left exposed to rains , if there is but little litter, the heaps are sheltered to prevent washing. These various modes of treatment are mostly confined to the accumulations during winter : but to obtain the largest amount, the required care should be continued through the whole year. Too often, a waste of materials is permitted in summer. The amount of manure might be greatly increased by saving all that may be had the year round. Compost heaps may be formed for securing liquid as well as solid matters that are often permitted to become lost. Housekeepers are sometimes puzzled to know what to do with the various refuse substances at house-cleaning, and straw beds have been actually emptied into the public streets. Weeds from the garden share the same destination. The tops of early potatoes are left scattered over the ground to the annoyance of the future plowman, instead of devoting them to the manure heap. To these might be added the scrapings of gutters and ditches, dooryard leaves waste from the kitchen, bones, and fish, the daily cleanings of the pig pen, pea vines, vault cleanings which have been mixed by daily additions of coal ashes or road dust, and droppings from the hen-house ; and then, throwing over this compost-medley a sufficient amount of slops and other liquids to promote some fermentation, in a few months the heap may be worked over after some decomposition has taken place.

The farmer and gardener who takes the pains to secure these fertilizing materials accomplishes two objects in one. He clears away offensive matter, and he adds to his yearly supply of manure. By carefully preventing any waste at his barns, besides adding all these resources, the amount of home-made fertilizers may be at least tripled, as compared with the amount obtained by the careless farmer. (1)

(1) An exaggeration, of course—greatly increased, no doubt.
A. R. J. F.

Quite coarse and apparently unpromising materials may be converted into finely pulverized fertilizers by means of some fermentation, and working over after rotting together for some months. In this connection, and for illustration, the mode by which fine manure is sometimes made for the nicer gardening operations, may be alluded to. The various coarse and fibrous matters, or common manure, is alternated in layers with road dust, turf, leaves, &c., and made into a square heap. A depression is made in the top in the form of a shallow kettle, to receive slops or liquid manure. The heap should be kept moist by the supply in this reservoir, but not so wet that the air cannot penetrate it to promote fermentation. In the course of a few months the heap will be ready to work over In large quantities, this manure will be a capital thing for top dressing the ground when sowing winter wheat; on a small scale and finely pulverized with a due amount of sand, it will answer well for window-gardening.

Country Gentleman.

Killing Daisies and Thistles.

EDS. COUNTRY GENTLEMAN—Many farmers fail to find time to pull thistles and mustard in grain, and white and yellow daisies in meadows. Where grain-fields are full of thistles, or yellow with mustard, the grain must be destroyed if an attempt is made to remove these weeds by hand. Such fields ought never to have been sowed to grain, as no more than an unprofitable half-crop can be expected—often not that. Fields that are overrun with weeds should be thoroughly summer fallowed, not simply plowed once after spring work and before haying, and the weeds allowed to run to seed during the rest of the season, but plowed well at least a half-dozen times, commencing in early spring and extending until late fall, with the pulverizer kept at work in the intervals between plowings. The farmer who does this work conscientiously will be most agreeably surprised at the good results accomplished in a single season. Although land may be full of weeds, seeds germinate and are destroyed by subsequent cultivation. Land cannot be cleaned while foul seeds lie dormant in the soil. There are fields which have comparatively little of mustard or thistles, and these should be removed by hand before they ripen their seeds. Thistles and mustard, both, mature faster than grain, and can be removed early enough in the season, so that the work will not materially injure the grain. This work should be attended to at once.

This is the time when the meadows should be searched for white and yellow daisies. Unless they have blossomed, it will require a close search to discover all the daisies. If the grass is light, it is more convenient to wait until the daisies are in blossom, as it is then much easier to get them all. It is somewhat difficult to go over a meadow that will cut from two or three tons of grass per acre, and make a clean job of pulling daisies, unless they are in blossom, and even then, such rank grass is quite apt to hide the daisies. The proper method is for a man to take a sharp hoe and a basket, using the hoe to cut up the daisies, roots and all, and putting them into the basket to carry them from the field. On account of the difficulty of finding the plants in the grass, it is advisable to go over the meadows twice, at an interval of a week or ten days. If the daisies are pulled and thrown down in the grass, the chances are that, sheltered by the grass, they will take root and ripen their seeds. It also a good plan when operating the mower to stop and dig up any daisies which escaped the first examination, and in such a case it is advisable to burn them, as the seeds are apt to be well matured. There is a very useful implement manufactured for the express purpose of digging daisies. It is similar to a hoe, except the edge is notched into several sharp teeth, which makes it much more efficient than an ordinary hoe.

It is a very good plan to mow a meadow early, if it is in any way foul. To say nothing of the quality of hay made from an early cutting, it certainly is worth while to cut the weeds early enough to prevent their ripening the seeds. I also suggest that if it is suspected that any manure on the farm is made from hay or grain containing foul seeds, it is a good practice to pile it up for six or eight months before using it. Such a course will be very apt to prevent the germination of foul seeds. Daisies rarely grow in grain, and mustard just as rarely in meadows. A heavy crop of clover is sure death to daisies. They seem to be smothered by the ranker growth of clover, and fail to mature their seeds. In a field where there is a growth of daisies, a generous use of fertilizers, especially of barnyard manure, and keeping the field seeded to clover, using an extra quantity of seed for this purpose, and breaking up every two years, cultivating for a while and again seeding to clover thickly, will finally eradicate the daisies. F. K. MORELAND.

St. Lawrence County, N. Y.

Management of Poultry Manure.

EDS. COUNTRY GENTLEMAN—A subscriber to your paper writes me a private note asking what I consider the best method of preserving and preparing poultry manure for use. This is a matter of general interest, and I beg space enough to reply to this question in this way:

Poultry manure is the most valuable of our home-made fertilizers: but, like all other manures, it is not because it is made by fowls that it is so valuable, but because of the peculiarly rich feeding of the fowls. This should not be forgotten in regard to all kinds of manure, because we can make them rich or poor as we feed the animals well or ill. Poultry manure of the ordinary kind is more or less valuable, according to its condition, as is shown here: There are in 1,000 pounds of hen manure 560 pounds of water, 16.3 of nitrogen, 8.5 of potash, and 15.4 of phosphoric acid. In 1,000 pounds of guano there are 148 pounds of water, 130 of nitrogen, 23 of potash, and 130 of phosphoric acid.

But if we get rid of the excess of water in the poultry manure, we nearly double its proportionate value, and bring it so much nearer in quality to guano. Again, guano is reduced by decomposition to a very soluble condition, and its actual value is increased because of the immediate availability of its elements. If we can, then, so prepare hen manure as to make its potential value available at once, we further add to its actual value, and bring it still nearer in comparison to the value of the standard fertilizer guano. Now this we can do, as suggested by my correspondent, by preparation. But this preparation must be such as will not waste any volatile element, which may be set loose in the decomposition, and that yet will produce the required decomposition. I have studied and experimented over this matter, and think I have got this manure in its most available condition, because I have increased its solubility four times above that of its fresh condition. Further, I have added to its fertilizing value by adding to the feed of my fowls bran and crushed fresh raw bones, which they consume with avidity, and with the best results as regards their health, production of eggs, and the certainly of hatching and producing strong chicks. But these are mentioned only by the way. In testing poultry manure with corn and melons, compared with stable manure and guano, I find a large handful of the former to be equal in every way to a heaping shovelful of the best stable manure, and a small handful (about one-fourth as much) of guano. The manure is prepared in the following manner: Every week the droppings are scraped up from the floor, which is of earth, and put into barrels and kept ready. The floor is then well dusted all over with earth dug from the yard out-

side and thrown in very easily through the window; air-slaked lime is then dusted over this until it is quite white. The droppings fall upon the lime, and when they are gathered, they are scraped up with the lime and the earth and put into the barrels. The barrels are kept out of doors, but covered to prevent exposure to rain. In three months the contents of a barrel become a brown soft powder, having but little appearance of the manure left, and as I have said, is four times as soluble as the fresh manure when it is taken out of the house—lime and earth mixed with it. Of the fresh manure, but two to three parts are soluble after drying it, while ten to twelve parts of compost, after three or four months, are soluble. I think manure made and prepared in this way is worth $20 a ton, or seven times the value, here, of the best stable manure, and one-fourth the value of Peruvian guano.(1) A flock of twenty-two hens, kept in one house, has made, since November last up to last week, five barrels, or about 1,000 pounds of the mixed compost, of which at least one third is clear droppings. This quantity I am sure is worth $10. I choose air-slaked lime in preference to plaster because of its useful effect in decomposing the manure, and the abundant organic matter—decaying sod—in the earth. The earth absorbs any ammonia which may be formed in the compost—is, in fact, one of those nitre beds which were once used to produce nitric acid by the nitrification of organic matter by the help of lime. The mixture is packed solidly in the barrels and is kept moist enough by absorption from the air to effect the nitrification. No doubt longer keeping would add still more to the solubility of the manure, by more completely disorganizing the organic matter, and more thoroughly effecting the nitrification. Plaster will simply keep the elements in the manure inert, and would be like putting the talent in the napkin or burying it in the earth, it is safe, but it has made no usury. Lime effects the necessary decomposition, which plaster does not. H. STEWART.

Bergen County, N. J.

Hindrances to Cabbage Culture

EDS. COUNTRY GENTLEMAN—F. K. Moreland has written well on the Farm Culture of Cabbages (p. 417), in which, though he speaks of the cabbage worm, he mentions no remedy except "a fertile, soil and early, close-heading varieties," which he seems to think "sufficient to overcome the evil." This has not done it in any case. True, the Filderkraut has a very close and remarkably hard head, and that, with me, has always escaped the ravages of the worm, which some attributed to its wonderful solidity, being, as some said, "so hard and solid that the worm cannot eu into it;" but, in my acquaintance with it, I seldom saw a worm on the head at all, the reason being, as I think, that the outside and first-grown leaves upon which the moth lays its eggs, and, of course, on which the larvæ are hatched, fall or roll away so far from the head that the worm has no way of access to it.

In the farm culture of cabbages, where one or more acres are set with them, where it would take too much time and be too much trouble to the farmer to pick them from, or apply some exterminator to every head, a very good preventive of the depredations of the moth is to belt the entire field with a setting of turnips, say one and a half rods wide, as the miller usually flutters only around the edge of a large field, and is about as fond of the turnips (Swede) as of cabbage. The turnip is little, if any, damaged by the worms. To guard against worms, we should not wish to make the setting of a large field *all Filderkrauts*, or *all* "*early*" ones, even though both were proof against them.

Another evil to which the cabbage is subject, of which he speaks, is "club-foot," from which cause alone he has had to re-set almost an entire plat. A certain remedy for this evil is salting, of which a tablespoonful may be put about the plant soon after it is set, though a better way is to broadcast a good coat of it, raking in or not, as you please, though raking is the better way. Few, if any, crops pay as well as cabbages. If you hoe or stir the ground about them early in the morning, they will grow all the better for it.

Montgomery County N. Y. O. E. HEWES.

(1) It should be analysed. "I think" won't do now-a-days. A. R. J. F.

Ensilage

The advocates of ensilage are not to have it all their own way, even on the other side of the Atlantic. Professor Brown, of the Ontario College of Agriculture, has been carrying out some experiments in feeding dairy cows with ensilage, and in his report he states:—"In competition with swede turnips ensilage corn gave 15 per cent less milk, 30 per cent less butter, and a poorer marketable butter in colour. The specific gravity of the milk obtained from the two kinds of diet differed but little, but the yield per cow per day was 33lb. from turnips, and only 28lb. from ensilage. The percentage of cream stood respectively 12 and 12½ per cent. Hay and bran were used with both." Professor Brown regards the use of ensilage as advisable only as a supplementary food or relish. Lord Tollemache has filled his first silo at Peckforton, and is confident of meeting with success. Lord Walsingham also has constructed four silos, and filled some of them. He is covering the grass with bran and then weighting it with boxes of gravel to ensure the exclusion of the air. The first will be opened in November, other two later on, and the last will not be opened till about April next. The Duke of Hamilton has constructed two silos at Great Glenham, Suffolk, and filled one of them last week. They are built in the bays of a barn, and are 22 feet long by 10 feet deep and 17 feet wide. *English paper.*

Destruction by and of the Wireworm.

Miss Ormerod has given an interesting and valuable lecture on "the wireworm; its history, attacks, and remedies." In these days of agricultural depression it is disagreeable to find that the wireworm lives for five years, feeds all the time, and likes almost every kind of food. It is an insect, therefore, which should be cleared out as speedily as possible. But it is obviously impossible for farmers to go through a hundred acres holding looking for worms the size of a short piece of flattened wire, though they have three pairs of little claw legs, and jaws which they use only too readily. The next best thing, therefore, is to destroy the eggs, render the residence of the grubs uncomfortable, or starve them by growing food which they cannot eat. By compressing the soil they are unable to move about freely. By feeding sheep and cattle on the ground with cake, the worms get starved and trodden out of existence. Chemical manures are also found serviceable. The burning of all grass, weeds, and roots is an effective, means of clearing away the insects by destroying their shelter; while the earthing (*sic*) of litter for use after decaying is equivalent to dressing the ground with wireworms. About the only thing which they cannot stand is Kurrachee, or Indian cake—really, mustard cake: they feed greedily upon it, and then die. Mustard, therefore, is a good clearing crop. (1)

(1) And rape or cotton-seed-cake, broken to the size of a hazlenut. I doubt that sowing mustard will have much effect, as it is the *gorging* that kills the brutes. A. R. J. F.

Fruits for Export

At the weekly meeting of the Massachusetts Horticultural Society, held Jan. 27th, the subject of "The best kinds of fruits for export," occupied the discussions of the day. E. W. Wood, chairman of the fruit committee, recommended more

attention to grape culture for this purpose, and said there was a general impression that it costs a great deal to grow grapes under glass, but that this could be very cheaply done in a cheap house with the vines planted outside, without fire heat. The expense in such a house is but little more than out doors. The border need not cost more than a flower or rose bed. Our warm sunshine gives a flavour greatly superior to that of grapes raised in Europe, and an English gardener, on tasting some Black Hamburghs here, without knowing the sort, thought he had never seen a grape so fine. Mr. Wood also recommended late pears for export, and named Bosc, Duchesse d'Anjou and Dana's Hovey. Alluding to the fact that in 188', 1,400,000 barrels of apples were exported, he said that nine-tenths of these were Baldwins, and recommended increased planting on the thousands of acres within twenty miles of Boston, where the land could be bought for fifty dollars an acre. If not sold fresh, evaporated fruit would find a market.

C. F. Curtis said that apples were sold wholly at auction when received at Liverpool, in lots of from twenty to a thousand barrels. Retail lot and odds and ends were not wanted. If well and tightly packed in the barrels, they would bring higher prices than such as would shake. The Baldwin was the only sort which could be obtained in sufficient quantity to sell by the thousand barrels. J. B. Moore reminded fruit growers that Boston is one day nearer to Europe than New-York, which may make the difference between profit and loss. Mr. Wood said that the Newtown Pippin once brought the highest price in London, but now the Baldwin would bring more. W. H Hunt recommended the Hunt Russet as better in some respects than the Baldwin, as the tree is much more hardy and the fruit was not injured if once frozen. Mr. Curtis spoke favorably of cold stowage, by which the keeping could be prolonged at least a month.

Country Gentleman.