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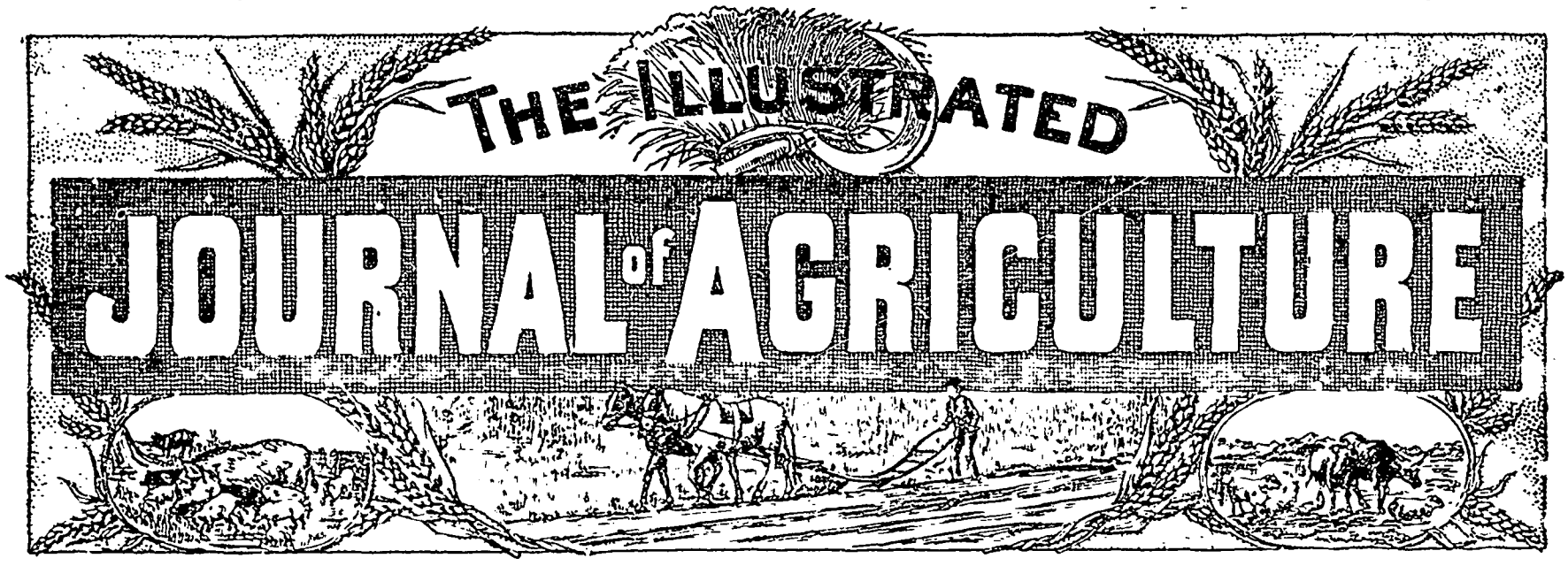

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THE ILLUSTRATED

Journal of Agriculture.

Montreal, June 1, 1897.

The Farm.

PRACTICAL FARMING.

(by James Dickson)

Green Oats — Reseeding — Turnips — Breeding Cattle.

GREEN OATS.—I regret very much that the elements are favoring the green oats system. At this writing (June 14th) there is still some seeding to do, and very generally arrangements are being made for green oats. The Autumn may be as late as the spring, so after all, the grain may attain perfection, but one night's frost will mean a loss of *thousands of dollars to the Province* if it comes on an uncut oatcrop. All this means: Cut early. In some sections, much of last year's crop was fed unthreshed, but very rarely was it cut early enough. The last stage of the growth is towards the filling of the grain from the straw, and not in the increase of nutriment in the whole plant.

RESEEDING.—The red clover appears to be completely killed out, and in many cases it will be found good policy to commence, as soon as the hay is off, to plough for reseeding the meadows. If the soil is not rich enough to get a good "catch", a very little fine manure harrowed in with the seed is a great help, and when the grass obtains a hold of the old sod, a good stand, and an improved field will be the result.

TURNIPS.—If the suggestions made last year have been followed this season, it will be worth hundreds of thousands to the Province. It is to be hoped that many have ploughed up a piece of old killed meadow, and sowed turnips. In this respect however a suggestion is now out of season. But the farmer who will this fall put in the cellar, say 20 . shels against every head of cattle, and 5 bushels against every sheep, or even half of that, will find the benefit before the next year's grass.

BREEDING CATTLE.—The Dominion and Provincial Governments have done and are doing a grand work in their efforts to advance the interests of Agriculture. The Dairy interests have been particularly cared for. And the cold storage and transportation scheme will enable Canada to carry on a profitable trade with Great Britain that will surprise many, who, at the instant, deplore the loss of the U. S. markets. All the efforts however; for a long series of years, have mainly been directed to that object. And it has been observed by farmers thoroughly acquainted with these matters that the past administrations appear to have lost hope of being able to apply a remedy for the continuous deterioration of the stock of the Province. I say continuous deterioration advisedly, as it must be admitted that the stock is far inferior to what it formerly was. The standard is lower. The size and quality of the cows is inferior. I am sorry to have to say it, but it is difficult for a beef feeder to obtain such steers as the country was formerly fully supplied with. And he often fills his stables with a pot bellied lot, peaked at both ends, bringing a hopeless, despondent look into his countenance while begrudging by feeding at a loss, where with properly bred animals he could have a reasonable remuneration for his labour. The deteriorating process has been so gradual and continuous that some may say they have not noticed it. But who that has seen them 30 years, even 50 years ago, can forget the bright Devons. The mild eyed Herefords, the woolies, and especially the high class, good all round Durhams, specking the fields at that time. In those days the rows of handsome steers of all ages, and brawny heifers pleasing the eye of the sharpest critic, were to be seen at every Exhibition in the Eastern Townships. There are now many that are good, but the standard is lower.

In those days there was not a Township but could point to farmers that were continually on the outlook for something that would improve their stock. There was also regular importations by the County Agr. Societies. Unfortunately for the country all this *has been changed. The encouragement* to importers and breeders is not commensurate with the outlay. And the preponderating influence of the Dairy interest has had much weight in this matter. Dairymen generally care nothing for the use of a bull except that the cows be brought to milk, and the theory that any kind of looking cow is a good cow if she yields a large quantity of milk, and without a proper estimate being placed upon the quality of the milk, and the future value of the animal as beef, any kind of a runt is used, each one endeavouring to do his duty in keeping up the quality of the stock, by keeping the best calves. How long can this continue?

In those times the Agricultural Societies regularly laid aside a part of their funds for the importation of improved stock. *At the present time, in* some parts, such a thing is scarcely known. Some of the members subscribe the necessary dollar with the expectation of several in the form of prizes, in return. And there are very many of the remainder, who though anxious for the importation of new blood, still each wants a particular breed of animal, and it certainly must be near their own door. The result being that, in many parishes, not a single thoroughbred animal of any kind is to be found. Another difficulty is the fact, that very many are not aware of the low standard of their animals. Three or four months ago the Journal contained a very instructive sketch of a fat steer with the different cuts of beef, and their prices, which ranged from 20 cents to 2½ cents a lb. The cattle on too many farms have too much rib and flank, too much shoulder and neck. Too much of the cheap beef. And the undeveloped rump and sirloins, the dear pieces, are too light to make a high priced animal. It is quite common for Quebec butchers at Christmas and Easter-tide to take the upper country beef from Montreal market to supply their customers, for the want of that suitable in their own markets. Said a Montreal exporter: "these Townships cattle, when they lose their belly, there's nothing to them." Although not general in its application, still unfortunately there is too much truth in this. Can anything be done to remedy this matter?

When farmers use any kind of animal to breed from, and without the requisite knowledge of the points that make a good animal, wanting the skill in breeding, and lacking the training and experience that enable the eye to detect the want of points that make the extra value of an animal: is it any wonder that in many parts of the country the sheep are like a cross between a goat and a merino, and that the cattle would not score a single point except on the horns and hoofs. Is there any cure for all this except by Legislation?

I am aware that people are apt to become restive when what they consider their private business is interfered with. But this is not a private matter. It is a Public Calamity, and must be dealt with as such. I am also aware this the better class of farmers of the Province would hail with pleasure such action by the administration as would remedy this evil. It is a fact that Agricultural Societies have often been discouraged rather than assisted in this matter. Certain restrictions and necessary formalities have been required which seemed to be more like ruling with a rod, than an effort to help those anxious on this matter. Upwards of 25 years it has been an almost continuous and pleasant duty to assist in the management of Agr. Societies, but the old Directors speak of old times with bated breath, and from their experience they very generally recognise the farmers as being as adhesive and protective of their own interests as a rope of sand, and express no hope in the matter except by Legislation.

I had the honour of being invited to address the administration of that time on this subject, with the result, that in regard to horses only one suggestion was adopted, namely the words "Haras National." And in regard to cattle, Farmers clubs were established, but without the necessary requirements for successful work. And with all deference to the past administrations, and the present, perhaps I may be allowed in a future issue to discuss a remedy.

STATE OF THE CROPS.

To the Editor of the "Journal of Agriculture."

In my last notes I made mention of the late season. I have been travelling in several localities lately and in many sections there had been no grain sown in May, this particularly so in the east end of Huntingdon Co; and in Napierville all the rivers are very high, many at flood height, low lands have been covered with water several times this year. The early sown grain is looking well, especially wheat and peas. The appearance is very good, a good colour and very even: the cool damp weather has prevented perhaps a rapid growth; but, on the other hand, there has been none scalded, as it is commonly called, when a great heat follows after rain. By the report lately issued, May has been the wettest we have had for seven years. A great

many have had to plant their corn and even some potatoes a second time, corn must have heat. June weather is more seasonable.

Hay is looking well. An old proverb: "A leaky May makes g at hay," that is where it was not winter killed; but there is hardly any clover any where. I hope no one will omit to sow plenty this year, although they lost all that was sown last year. Pastures are now doing well, there should be a wonderful make of cheese for the month of June; the price is about 1½ cents better than last year at this time. The make of butter will be less than last year for June. As the price of cheese so far has been rather better than butter, for the last half of April and May, quite a number of factories are rigged up for both and therefore can make whatever pays best; the greater part are making cheese. I should not be much surprised to see them come nearer on a par before the month finishes. I would also advise the farmers to begin before the cows start to fall in their milk to feed some green fodder, they will not eat much at first, but make a start and for best results be sure and cut it 12 hours before using, that is cut enough in the morning for the evening and likewise in the evening for the next morning; and should cheese sell between 8 and 10 cents per lb. a little ground grain (mould) with wheat bran will also pay, and with butter selling, say at 18c. or over, sell your grain by your cows, you will get as much for it as from the grain merchant, your cows will be much better, and the manure a great deal better also.

Small fruits are doing well, gooseberries especially; apples, a very fair appearance, should there be apples for all the blossoms there will be enough and to spare; we cannot expect a crop of fruit like last year, a smaller crop would possibly bring more money although the great crop, last year, was a good thing, as it got people to eat more fruit than usual (1).

How much more beneficial to humanity it would be if the money spent in liquors was spent in fruit, no danger of delirium tremens, and consequently fewer murders.

Weeds are doing well and thistles plenty, more than usually. Here, in Chateauguay, we have a great pest; it is sweet clover, no danger of the frost killing it, it is carried down by the water. I do not know the best means of killing it perhaps some one will give one.

PETER MACFARLANE.

Chateauguay, 7th June 1897.

Montreal 12th June 1897.

My Dear Sir,

This week I have been in Berthier, Joliette, L'Assomption and Terrebonne Counties, and I must say the prospects for hay are slim indeed, especially in the 2 former counties near the St. Lawrence. Back in the mountains it looks some better, grain is looking well where sown; but hay and pasture very light: in fact some places, you would hardly think there was enough on 10 acres to graze a goat let alone say 2 or 3 half starved cattle.

Yours truly,

PETER MACFARLANE.

(1) Quite a number who have not been spraying their apple trees in the past, saying it was no use, are now spraying this year: it takes a long time for some people to get convinced, still there is hope when they get converted by seeing how others succeed.

THE MAKING AND CARE OF FARM MANURE.

(By A. Knight).

In writing this paper I do so with the full conviction that at the present date there is no subject or labor connected with the management of the farm which is of more importance or causes intelligent farmers of Canada more serious thought than manure.

It is to be regretted that we as farmers in the past gave it so little of our attention. When the early settlers began tilling the soil there was in it about every thing required for the growth of our crop and for that and other reasons they gave manure or its value very little thought or care, but as each year's crop has been taking from the soil the different elements required for plant growth, the soil has become so impoverished that at the present time a large part of our land does not give in return for labor expended a sufficient crop to pay the farmer for his labor, and it has now become a very serious thought to every farmer how to bring back the old time productiveness of the soil.

As we find from the best authority, farm-yard manure is the cheapest fertilizer for the farm. In it we find every thing required for plant growth and its benefit to the soil lasts much longer than any artificial fertilizer that I have yet used; but the value of farm-yard manure depends to a great extent of the manner of care and preparation it receives. The old method of allowing manure to accumulate in the farm yard and the rains to leach out and wash away the most valuable parts, the remainder hauled out and placed in a pile to rot, before using on the land actually lose 75 p. c. of its value. To get the full value of manure made on the farm it must have proper care, and there is no part of the farm work that gives a better return for the labor expended than manure. In the first place it is very important that all the liquid parts should be retained, therefore it requires good floors in the stables. I find that concrete or cement floors give the best satisfaction and I consider them the cheapest and best, for they prevent any bad odors remaining in the stable. The manure should be piled under cover. To make it convenient, a shed should be built in a central place, so that all manure made on the farm would be piled together, for it is a very necessary part of the making of good manure to mix the different kinds together. For I find horse manure alone will become too hot and burn, which causes it to be of very little use and very hard to handle, while cow manure alone will not heat but freeze solid which also causes hard work to handle it, but by piling all kinds together under cover, it causes just the right heat and moisture to make the pile fit for the land.

The litter or bedding is a very important part in making manure, for by using a sufficient quantity of bedding to absorb all the liquids, it fully doubles the value of the manure, and it is the most convenient way of returning the straw back to the soil. As most farmers have all the straw required, it answers well to make convenient to handle and improve the manure. The straw should be chopped fine. (1) If straw is scarce, leaves gathered from the forest make fully as good an absorbent. In fact any and every thing that will add to the value of the manure heap should be added to it. But right here let me say, never throw any rubbish on the manure heap that will interfere with the handling of it. Gypsum or land plaster used as a preventatite of the escape of ammonia, by sifting small quantities on the floor daily, adds largely to the value of the manure but lime or ashes should never be used as they cause the escape instead of the retention of the ammonia. The manure when placed in a shed should be spread flat rather than piled up, and if young stock or sheep are allowed to run on it, it will improve it, as by being firmly packed it does not allow the carbon to escape, for loosely piled manure ferments much quicker and causes a greater loss than when firmly packed; but to ensure any loss of nitrogen it is a good practice to sprinkle daily a small quantity of land plaster over the heap. Manure made in this manner will be sufficiently rotten by spring to place on fields where wanted, and by mixing it with the soil fresh from the heap we get fully double the benefit, than by hauling out in a heap to rot before applying it. I find some farmers use peat or black muck in their stables as an absorbent. I do not approve of the plan as it causes a great amount of labor and too dirty especially in the dairy stables, but where it can be obtained at a reasonable amount of labor and cost it is of great value to mix with the manure heap, making each load thus mixed of equal value to the manure. (2)

As ashes are part of farm manure, a word might be said of their use and value. Their chief value is in the potash (3) they contain, and for that reason are one of the best fertilizer used in the garden and orchard, but I am sorry to say but few of our farmers place any value on their ashes, giving away a load for a few cents' worth of soap while it is safe to place their value at twenty-five cents per bushel.

The farmers having prepared a good manure pile, a few words on the proper use of it will not be out of place. I find I get the best value from my manure pile to use it all on the hoed-crop. I find it is the best paying crop as the thorough cultivation given to that crop fully incorporates the manure with the soil, causing it to lose none of its qualities which it is very apt to do when used as a top dressing on meadows or grain. Also the foul weed seeds are thus destroyed by continuous hoeing and by taking a new field each year, I enrich and thoroughly clean all my work land in a few years. In conclusion a word might be safely said that there are just three things necessary in the making and care of farm manure.

1.—A sufficient quantity of stock well fed and properly handled in a stable with water-tight floors.

2.—A covered shed in which the manure is placed until taken to the field to prevent the heavy rains washing the best part out and carrying it down stream as is often seen on passing some farms after a freshet.

3.—To have the manure thoroughly mixed with the soil when placed on the field so as to retain all its valuable parts.

(1) Four-inch straw-chaff is fine enough.—Ed.

(2) Very strong language.—Ed.

(3) And the phosphoric acid.—Ed.

CULTIVATION OF CARROTS.

The best soil for carrots is a sandy loam, though white carrots succeed well in heavy land that is well drained and rich. Never sow carrots but in clean land, because if it is a wet summer it is almost impossible to clean them. Always manure the land in the fall and plough it in. If the manure is free of weeds (1), new made dung will give the best results. Twenty-five tons of manure to the acre is as much as can be mixed with the soil properly. Before cross plowing in the spring, harrow the land well so as to kill any weeds that may be growing, and the more you work your land before sowing, the less you will need to do it after. After thoroughly harrowing, roll the land before drilling. I prefer to sow on raised drills, but not high, 20 or 24 inches apart; with 28 in drills, you lose too much land. (2) Roll the drills before sowing. You should use the wheel hoe to side hoe the plants as soon as you can see them in rows and keep it going till they are ready to thin. Short red carrots don't need much thinning, if they are left an inch apart they shove out one another and you will have better carrots than if you thinned them out too much, as many of the very large roots are sure to crack and won't keep. (3) White carrots should be thinned out to 3 or 4 inches apart as they are stronger growers than the red. Keep the horse hoe going between the rows as often as you can, as long as it won't break the leaves, and especially in dry weather, this will help to keep the plants growing. If possible, thin in cloudy weather. (4) Carrots are grand feed for horses and especially young horses, they help their growth greatly and give them fine coats of hair. About 3 lbs. of seed per acre if sown by a seed drill is enough. For stock feeding, I prefer the Iverson's champion white, which is a half long variety, very solid, a heavy cropper, and keeps much better through the winter than any of the red varieties. You can raise 15 to 20 tons per acre, and at this rate you have a cheap succulent food for horses and cattle too.

(Signed) D. McLACHLAN,
Petite Côte.

(1) Very good.—Ed.

(2) Very good, again.—Ed.

(3) Excellent indeed.—Ed.

(4) That does not matter, if the land is properly prepared.—Ed.

THE OX-EYED DAISY.

I am fortunate enough to have several tons of the despised oxyed or white daisy on hand. My experience shows that this will not interfere with other grasses very seriously, but my land well seeded with clover and timothy will only last about three years. I think daisies as valuable for milch cows as any hay I ever fed. I am feeding one ration of daisy at noon, silage morning and night. The change from clover and timothy to daisy gives 10 p. c., more milk. It should be cut in June to get best results.—(A. K. C., Ohio.)

For thawing pumps that are overlooked and allowed to freeze up during extremely cold weather in winter, take a three-quarter inch gas or other pipe six feet long, remove the top of the pump, push the pipe down beside the lifting rod until it sets on the ice, then insert a funnel in the end of the pipe and pour in boiling water. The pipe will drop as the ice is melted and when a hole has been thawed the hot water soon melts the ice, and the pump is opened. This may be done in from 10 to 20 minutes.—(B. F. Tinkham, Coos Co., N H.

The practice of feeding the grain crops, oats or oats and peas, unthreshed, is becoming quite general in this variety. By inquiry I find some of those who are feeding their grain in this way are doubtful of its utility. The question whether the waste from grain passing through the animals undigested is less or greater than the cost of threshing and mixing is as yet, among practical feeders, an unsolved problem. The rule is to harvest the grain, to be fed unthreshed, before fully ripening. Often, from the state of the weather or pressing work in other directions, it does not get harvested till nearly or quite ripe.—(H. L. Leland, Piscataquis Co., Me.

"N. Eng. Homestead."

FIELD EXPERIMENTS WITH TOBACCO IN MASS.

Cigar leaf growers of Mass, in 1893, donated the use of one-twelfth acre plots at Agawam, Westfield and Hatfield for experimental purposes in tests of fertilizing materials. A deep, sandy soil was chosen for each experiment. The same kind and amount of fertilizing ingredients were used for three successive years on the same plots in each of the three towns, but the 10 plots in each town were differently fertilized. After three years of observation in each town, the conclusions noted below were observed and are detailed in numerous tables in Bulletin 47 of the Hatch experiment station at Amherst, which will be sent free to all Mass farmers who write to the director of the station for it.

A fine and deep working of the soil, early application and good diffusion of fertilizers, early planting and a suitable number of plants per acre exert a decided influence on quality and quantity of the crop. Early planting secures the benefit of winter moisture. Rows 3 1-3 ft. apart with plants 20 in. apart in the row at Westfield, and row 2 2-3 ft. apart with plants 2 ft. apart in the row at Hatfield, gave better returns than rows 3 ft. apart with plants 18 in. apart in the row at Agawam.

A timely shallow use of the cultivator wherever weeds appear favors uniform progress of growth. A careless use of the cultivator invariably checks more or less the growth of the plants and modifies their structure and general character.

The different fertilizer mixtures affected in a less marked degree the weight of the crop by their aid than the quality. New lands reduced by previous cropping to a state approaching general exhaustion of available plant food if otherwise well fitted for raising tobacco, have given excellent results when supplied with a suitable mixture of fertilizing ingredients in quantities similar to those applied during the experiments at Westfield. Such lands are at times preferable to old tobacco lands overcharged with remnants of all kinds of saline ingredients usually associated with the common run of commercial fertilizers.

Cottonseed meal, linseed meal and castor pomace have proved equally good sources of nitrogen, for the successful raising of tobacco, when used in connection with nitrate of soda or potash, sufficient to furnish one-fourth of the nitrogen called for by the crop.(1)

Nitrate of soda as part of the nitrogen supply of the fertilizer, 25 per cent, when used in presence of acid phosphate or dissolved bone black, has been accompanied with better results regarding quality of crop than nitrate of potash under otherwise similar conditions.

Cottonseed hull ashes and high grade sulphate of potash have proved most valuable sources of potash for tobacco, the former in the majority of cases leading. Nitrate of potash has produced excellent results when used in connection with an alkaline phosphate as phosphatic slag meal or with carbonate of potash-magnesia. The results with potash-magnesia sulphate, as main potash sources of a tobacco fertilizer, are not encouraging.

The difference noticed in the color of ash, in case of the crop being raised upon different plots, is in several instances so slight that any attempt, at classifying the various fertilizers used with reference to their superior fitness cannot be otherwise than somewhat arbitrary. With such a classification in mind, the plots producing the four best lots of leaf were raised with the following fertilizers:

Plot No. 4—Nitrate of soda 160 lbs, containing nitrogen 25 lbs; castor pomace 1340 lbs, containing nitrogen 75 lbs, potash 45½ lbs, and phosphoric acid 31 lbs; cottonseed hull ashes 1060 lbs, containing potash 254 lbs, and phosphoric acid 84 lbs; total, nitrogen 100 lbs, potash 300 lbs and phosphoric acid 115 lbs.

Plot No. 3—Nitrate of soda 160 lbs, containing 25 lbs nitrogen; cottonseed hull ashes 1142 lbs, containing potash 274 lbs, and phosphoric acid 90½ lbs; cottonseed meal 1154 lbs, containing nitrogen 75 lbs, potash 26 lbs, phosphoric acid 37 lbs; total nitrogen 100 lbs, potash 300 lbs and phosphoric acid 127½ lbs. Plot No. 9—Nitrate of potash 195 lbs, containing nitrogen 25 lbs, and potash 88 lbs; cottonseed meal 1154 lbs, containing nitrogen 75 lbs, potash 26 lbs and phosphoric acid 37 lbs; cottonseed hull ashes 776 lbs, containing potash 186 lbs and phosphoric acid 62 lbs; total nitrogen 100 lbs, potash 300 lbs and phosphoric acid 99 lbs. Plot No. 10.—Nitrate of potash 195 lbs, containing nitrogen 25 lbs, and potash 88 lbs. castor pomace 1340 lbs, containing nitrogen 75 lbs, potash 45½ lbs and phosphoric acid 31 lbs; phosphatic slag meal 157 lbs, containing phosphoric acid 29 lbs; carbonate of potash-magnesia 901 lbs, containing potash 166½ lbs; total, nitrogen 100 lbs, potash 300 lbs and phosphoric acid 60 lbs. The observations with barnyard manure were very encouraging. The 10 tons per acre contained nearly 200 lbs potash and 30 to 40 lbs available phosphoric acid less than the adopted formula of commercial fertilizing ingredients called for.

"N. Eng. Homestead."

(1) Our grand crop of tobacco, at Joliette, that people came miles to see, was grown with poor dung and tanners' refuse mixed.—Ed.

LUPINS.—As to the cultivation of lupins, there appears to be nothing to frighten any intending cultivator. The crop is only proposed as suitable for poor sandy soils which are always easy to work, so that the preparation of the ground is evidently simple and inexpensive. As seeding takes place in May or June, there is ample time to make inquiries and obtain seed, and as either broadcasting or drilling may be used, the entire methods are well in hand for any farmer who thinks of making his experiment. This is what the late Professor Wilson wrote upon the method of cultivation:—"Being an annual, the lupin is well suited for a rotation plant—as a substitute for clover, for instance—on our light sandy soils. It is rather delicate, and should not be sown until the period of spring frosts has passed, as one night's frost would effectually destroy it. One bushel of seed is quite sufficient for an acre, which should always be drilled in rows from 24 inches apart, that the horse-hoe may be used, and so that the hand-hoe during their growth, which is the only attention they require. The growth of the crop is extremely rapid. In about ten weeks, if the weather be genial, they are usually in flower, when, if used for forage purposes, they should be cut and consumed as speedily as possible, as after that process has commenced their feeding properties diminish and they begin to exhaust the soil. (?) The leaves and stem, although less nutritive than the seed pods, are more relished by sheep and cattle, the seed pods being bitter in taste, and are generally at first refused by them." They may also be cut as hay at the flowering period. Of the two kinds, the yellow lupin is preferred for soiling or for hay, while the blue variety is the best for seed. If harvested, the crop is treated in all respects like beans, and should be ready for harvesting by the first or second week in August.—Ex.

MAKING AND CARE OF FARM MANURE.

As to the making of Farm Manure, chemists and experimentalists tell us that the three essential ingredients of plant food are nitrogen, phosphoric acid and potash, besides some less essential ones. These substances are what we buy in commercial fertilizers. Farm Manure contains all the ingredients necessary to plant life. Now, the question is to ascertain, if we know how to make a farm manure that shall contain the greatest amount of substances that enter so largely into the elements of plant growth.

Chemists tell us also that some products contain more of the elements above referred to than others, and have *given us tables showing us their value* as food for our animals and also the value of the manure made by feeding these substances.

Now, if we feed our animals such foods as are low in the essential elements, we shall have a manure correspondingly low in the desired elements of plant food. Manure made from an animal fed on straw alone is barely worth the handling, whereas manure made from dairy cows that are fed and kept as they should be is worth many times as much per ton as the straw manure.

Most farmers feed only such grains as are grown on the farm, to those we would recommend the purchase of a certain amount of Oil cake or Cotton seed meal as they are generally the cheapest and best feeds you can buy when you take into consideration their manurial value as well as their feeding value. From our own experience profit lies in the direction of liberal feeding of farm animals, and as far as making farm manure is concerned, it is undoubtedly true. Therefore, if you would have more and better manure feed more liberally of the best feeds obtainable.

As to the care of Farm Manure it commences the moment it is dropped by the animal; you must provide an absorbant to absorb all the urine and mix it with the solid. In choosing your *absorbent to absorb* all the urine and as in choosing your feed, that is, get the best for the purpose if the cost is not too high. Throughout the greater part of this country no cheaper or better absorbent can be obtained than straw, which I would recommend to be always cut short by a chaff-cutter. It will pay for the labour of cutting in the case of handling the manure afterwards as well as taking up the urine better and mixing better with the solids, would also use a small quantity of land plaster in the stables.

As to the care of the manure after leaving the stables, opinions differ considerably. Our own experience has been that it is best to keep the horse manure thoroughly mixed with the others, thereby preventing too much fermentation in the horse manure and quickening it in the others. Hauling the manure to the fields in winter and putting it in heaps of about 50 to 75 loads each, is the way we find to suit best, as the loss by exposure is partly made up by the cheaper handling. In case of keeping it over summer for application in the fall it should be protected either by being covered, or by removal a short distance from the sides of any building so as to prevent too much leaching. We always find it beneficial if left in a heap over summer to spread a little land plaster over it, and then cover with a layer of earth thereby preventing too much evaporation and leaching until you are ready to use it, when I think you will be satisfied with it. (1)

DRAINING.

(Continued.)

Depth — Distance — Fall - Tools — Bush-drains.

In my last article on this subject I went over the theoretical points necessary to be understood by every one before the practice is attacked. We saw that the water entered at the bottom of the conduit; that gravity acted more efficiently in proportion to the height of the column of water already existing in the land; and that to get rid of the superfluous water by evaporation produced cold instead of heat: in other words, that, in undrained land, the first efforts of the sun in early spring were injurious instead of beneficial.

The practical questions that first

(1) No name appended.

meet us are the following: what depth shall we make the drains? what direction shall we give them? and how shall we cut them?

As a general rule, increased depth will allow of an increased distance between the drains. But the question really sums itself up in this: I have so much money to spend in draining: how many cubic yards of soil can I dry for one dollar? For, if the water level in the land be not lowered to a depth beyond the reach of capillary attraction, the full benefit of drainage will not be gained, evaporation will still exercise its malefic influence. This level we may assume to be reached at 4½ feet; and, in England, the government Inspectors had strict orders not to sign certificates for the payment of drainage loans unless they found this depth rigidly adhered to. I know there is not much hope of such a depth being arrived at here, but I cannot help saying that at a less depth than 33 inches the work and materials will be as good as thrown away. Still, it is a matter for the farmer's own consideration whether he will put down a few deep drains or a great many shallow ones. the first will, in the majority of soils in this province, draw well at intervals of 50 feet; but the latter will be probably next to useless at more than 20 feet apart. At any rate, when we have to deal with such expensive materials as pipe-tiles, I should think no sensible man would leave them within reach of the frost.

Depth of drains.	Distance apart	Mass of soil drained in cubic yards.
2 feet.	24 feet.	3226⅔
3 "	32½ "	4840
4 "	50 "	6153

Generally, double the depth of drain has effect on about twice the cubical contents of earth, and about half more in extent of surface; but as regards price, at the usual cost of digging drains, &c., three times as many cubic yard are dried for one cent by deep drains as are dried for the same amount by shallow ones. The exact figures are 2 cu. yds. at 2 feet deep and 24 feet apart; 4 cu. yds. at 3 feet and 33⅓ feet; and 12 cu. yds. at 4 feet and 50 feet, excluding fractions. I have taken the prices I have myself paid in England, about half what it would cost here.

The direction in which the drains should run. There is nothing so certain as the answer to this: up and down the greatest fall. And I think the following considerations will make this pretty plain. One law of hydraulics known to every one is that water always seeks the lowest level in all directions. In fig. 1, let "a b c d" be a field sloping from "a b" to "c d," and let "e f" be a main drain into which the side drains "g h, j k, l m. n o, p q and r s fall.

Now there is nothing more clear, in the case where drains cross the fall, than that the water that falls at "v" must have the whole distance to travel from "v", just below the drain "j k," in a diagonal line until it arrives at the drain "g h" (for it cannot run up hill into "j k") that is, actually, farther than the distance between the two drains: the same with the water that falls at "w", below the drain "l m." But take a glance at the other side of the plan, and look at the drains "n-o." "p-q," "r-s," and it will be evident that the water between each pair of drains has only a little farther to run than half the distance between the two drains. in fact where the fall is slight there is a mere trifle of extra journey for it.

Again, if we look at the plan No. 2, where "a" and "b" are vertical sections of drains, and the dark line above "c" a foot of mould, (the plough furrow, in fact) the rain that falls on "c" will be quickly absorbed, and, seeking the lowest level by gravity, will hasten at first perpendicularly towards the

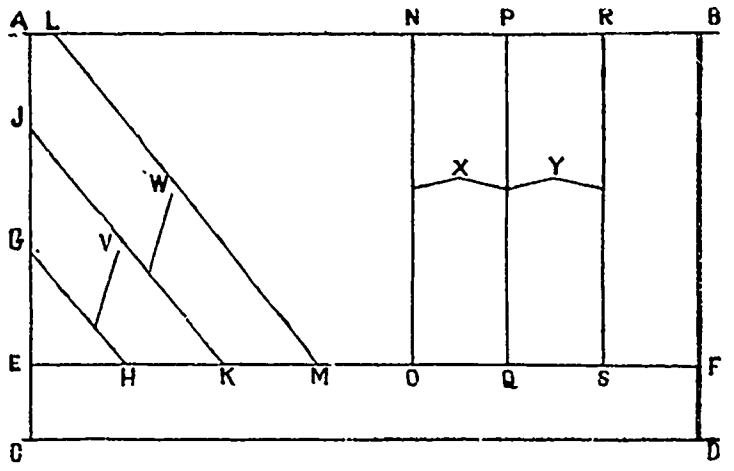


FIG. 1.

line "d e;" and, in doing so, the portions nearest the drains will find it easier to move towards the open conduits "d" and "e" than towards the firm ground at "h"; moving thus there will always be a higher level of water at "h," and the accumulation there will cause a strong lateral pressure on each side towards "d" and "e"; and the greater the accumulation the stronger will be the pressure. Some people imagine that water finds its way into the drains as it does from the ridge of a house into the "rones" or shoots; but they are those who have never given themselves the trouble to think about the matter. Another reason why drains should run in the line of the greatest fall is that almost invariably the substrata lie "horizontally." Now looking at figure 3, in which "a b" is the plane of the surface soil, and "c d e f," substrata

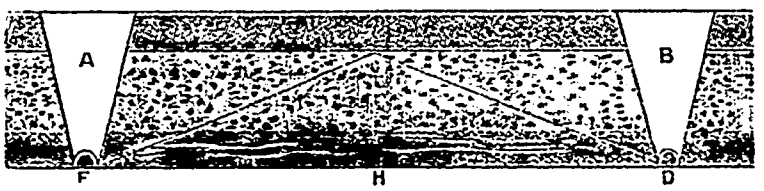


FIG. 2.

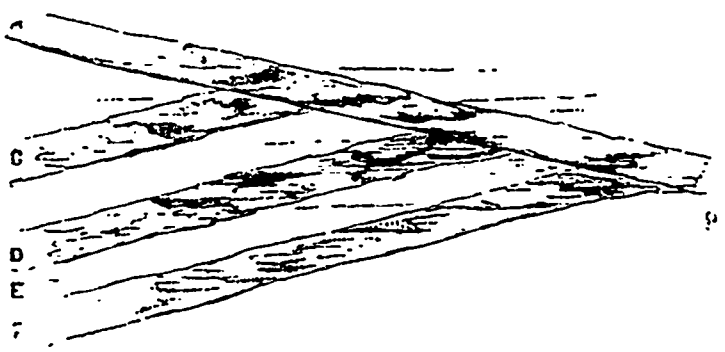


FIG. 3.

concealed from view by the surface, it is evident that drains across the surface "a b" might very easily miss cutting any one or more of the substrata, which, as springs almost always break out at the point of intersection, would be an awkward affair. So that, although oblique drains might cut through a vein of sand or gravel, and thereby carry off the water it contains, the drains along the greatest fall must cut it; and they are so preferable, as has been shown, in other respects, that they should always be adopted.

Main drains should of course occupy the lowest place in the field, or part of the field, to be drained, and where this is attended to as it ought to be, many a dollar may be saved. For example, many of our Kentish farms lie along a valley formed by a tiny brook, which acts as the receiver of the ditches which, in their turn, carry off the water which issues from the drains. The fields all run "N and S" from the brook. The bottom of the fields is fine loam on gravel extending half way up the slope; the top a stiff (oh! very stiff) clay, full of springs and of a conglomerate of lime and shells. A grand opportunity of wasting money in draining the whole piece! Whereas, in each field one main drain running into the open side ditches about the middle of the field, and receiving short side drains 45 feet apart, and from 4 to 5 feet deep, cured the whole of the farms at a very moderate outlay. Such a state of land may be seen any day for many a mile along the road from Lennoxville to Coaticook. Springs, finding a weak spot between the strata of rock, burst out, and spewing all over the lower ground, spoil every year twice as much at least as it would cost to drain it.

It may be as well to say here, once for all, that whether we are draining a town or a field, the small drains should always run into the main at right angles, with a curve for the last few feet, to allow its water to run with instead of against the current of the water it meets with in the main. (1)

(1) This will be shown in a cut later on.—Ed.

Whether the main should be lower than the small drains is a doubtful point. I prefer that they should be level, as the wash of a rush of water in sudden storms is a dangerous thing, if there is any fall at the junction. At all events, great care should be taken, whatever materials are used, to make the junction as secure as possible. When the main is being cut, the distance between the side drains having been determined upon, each side drain should be opened for a couple of yards as the main goes on: thus the main can be finished, materials placed, and the earth returned, from end to end without stopping. On springy ground, this will be found very important.

Where land is subject to more or less permanent bursts of water from springs, I advise all drainers to strike the outburst straight in the face. Cunning men, in backward districts in England, try to dodge, or circumvent, the "weeping spots", as they call them, and invariably cost their employer about four times as much as their work is worth. I knew three or four of these worthies. They always worked alone, whereas there never should be less than 3 men at a drain, and 4 are better still. All the drains I have seen made in this country are too wide atop. The great saving of expense lies in keeping down the quantity of earth moved, and if you start with two feet instead of 14 inches, it will amount to a great many pounds weight of unnecessary earth to be moved to a thousand rod of drains. Fourteen inches are plenty for the top spit, diminishing gradually till, with pipes, the conduit just fits the drain. And this brings us to another important point: the tools to be used in draining, and the materials that are to serve as the conduits, or ducts, for the water.

Now it will depend upon the latter, the ducts, what tools we want, especially for the bottom spit and the last crumbs or mud. At all events we shall need a line of some sort to mark out the lengths of drain; a spade of ordinary dimensions for the two or three first draws; a pick to dislodge stones, or to get through any "hard pan" we may meet with; a shovel to throw out the crumbs with, and a draw-scoop to finish off the bottom with.

If we are to use pipes, we shall need a narrow semi-cylindrical tool, sold at any of the seed warehouses, made on purpose to cut out a narrow bed closely fitting the pipe.

If, on the other hand, we use stones or bushes, the last spit must be removed by means of a very narrow spade of the ordinary shape. The pick had better be of the "tramp" sort, as in that case the men except the shoveller can all work with their faces towards the opened part of the drain.

The draw scoop must be semi-cylindrical for pipes; but flat-backed and 4 inches broad, if for other materials. In laying the pipes, the workman stands across the drain, and begins to lay from the mouth of the drain backwards, laying each pipe in its seat by means of a pole at the end of which is a short rod of iron at right angles on which the pipe is threaded, dropped carefully down, and adjusted to its place by the rod.

But this by the way, for fear I should forget it. I need hardly say that the tools should be kept sharp, and where there is a tenacious clay to be cut, the workman will be all the better for a bucket of water handy, to dip his spade into. Having drawn out our line of

drain with accuracy, the question arises: shall we use a plough for the first 10 inches or not? It depends. If the subsoil is hard and not given to fall (cave) in, a plough may be used to advantage; but if the ground is wet and crumbly, rough and "tussocky," and the drains are to be of decent depth, considering the risk of straining the horses, and of causing extra work in throwing out fallen-in sides of the drain caused by the tramping of the horses, I prefer taking the whole out by manual labor.

Whatever materials we are to use, we may start by taking three draws of the common spade, each draw to be carefully shovelled out by the second man working with his face to the digger, who works backwards. This will give us about 3 x 9 are 27 inches in depth, and, at our proposed depth of 33 inches, as the shallowest admissible, it is time to think of the bottoming.

Suppose we are going to use bushes. The bush should have been prepared in winter, or at any rate when the leaf is off, and should consist of fresh, limber twigs about 3 feet long, as full of life as possible, and with nothing thicker than half an inch in diameter amongst them. If any of the boughs seem inclined to lie awkwardly, a slight tap with a sharp axe will correct the fault.

The drainer, still working backwards, should remove the remaining 6 inches with the narrowest spade, leaving the bottom 4 inches wide, and neatly finished, taking out the crumbs with the flat draw scoop. You may observe that there will in this case be a trough left at the bottom of the drain 6 inches deep, by 4 in width. This is the real conduit, the bushes are only meant to keep it open. In a few years they will perish, but the arch of the drain will remain for several years more if treated as I shall advise in the sequel.

The drain being now ready to receive its filling, let the workman take a sufficient quantity of the bushes in his hands, straightening them as much as possible, and lay them carefully at the bottom of the drain, trampling them firmly down. Then another man, a boy will do, should hand the drainer a fresh bundle to be laid further on, but with the top ends resting on the bottom end of the first bundle, and so on up the drain as far as it has been bottomed out. Care should be taken not to brush in the earth from the sides.

Now the filling-in may begin. Remembering that the water is to enter the drain from the bottom, our main object should be to prevent any rush of water downwards into the top of the drain, bringing earth and sand with it, and thereby choking the duct: we take the stiffest, soapiest clay we can find, place it carefully on the bushes, and trample it down firmly. The firmest part of the original earth taken out of the drain is then returned on to the clay, and the rest thrown in anyhow.

If in bush drains the junctions with the main drain were made with pipes, it would be all the better, and the discharge of the main into the open ditch should be invariably piped for four or five yards upwards: wooden pipes, square or round, will do. The fall towards the mouth of the main where it joins the ditch should be as rapid as possible, to avoid a sudden stoppage from frost.

It may be necessary, in very level land, to use mechanical means to determine the fall of the ground. An ordinary "spirit-level", mounted on a pole with a spike at the end, is quite sufficient for the purpose, and is used in this way.

Set the level in the middle of the ground to be drained, and placing the eye-sights in the proper direction, turn the screw until the air-bubble rests in the middle of the glass tube. An assistant should hold up a rod at the end of the ground in that direction, and mark a point indicated by the observer on the rod. The same operation is gone through at the other end of the ground; and if the two marks agree, the whole piece is on a level. But if the mark at the first station is at 3 ft. 9 in. from the ground, and 4 ft 8 in. at the second, there is a fall of 11 inches from the first to the second station. A very little practice with the level will make any one handy with it; but it is seldom necessary, except to intimidate the workmen by making them believe that the instrument will detect their tricks.

A very small descent is sufficient for the fall in pipe-drains. Cresy, the Civil Engineer, says that one foot in two hundred and twenty yards is enough: 1-660! The deeper the water in the drain the less fall required; thus, deep rivers only want one foot in a mile. In very low lands I have found it necessary, sometimes, to take the main a long way down into the ditch to gain a fall; and I have seen, at Longleat, the Marquis of Bath's place in Wiltshire, an iron pipe carried under a mill-stream to take away the water from the drainage of a meadow on higher ground. But in all cases of this sort, the services of a competent engineer should be secured at once; it will be found the cheapest plan in the long run.

(To be continued).

AN EMERGENCY.

If the sailor had all fair weather his life would be comparatively an easy one, but such is not the case, he has to encounter storms, head winds, and contrary currents, but instead of giving up in despair in the face of all such difficulties, he redoubles his exertions and arranges his sails in such manner as he knows will enable them to catch the favouring breeze which will in time bring him to the "haven where he would be."

In consequence of the unfavourable state of the weather for some time past, our farmers are in an emergency and are sailing against the wind. The want of the natural protection of the snow at the beginning of last winter, the severe cold which followed while the ground was yet uncovered, have destroyed the hay crop in many places, and if something cannot be done to obviate the difficulty, in some degree at least, many a poor animal will suffer next winter for the want of forage and some men occupying poor or badly tilled farms will be totally ruined.

The question then arises what can be done? When this reaches your readers, it will not be too late to adopt some measures which will, at least, help to overcome the trouble in some degree. For instance, if the land, where the grass is killed, is carefully plowed and sown with some forage crop to be cut green and made into hay, that is to say cured like hay, even if a large crop is not secured, it will be well. on the principle that "half a loaf is better than no bread," perhaps, under the circumstances, oats may be the most economical, the seed is fortunately cheap, and oats will yet have time to grow into a useful crop even if they do not ripen. If the crop is cut before the straw ripens and the seed is in the milk they will possess nutritive qualities of great value. I remember when a young man we used to cut a portion of our oats when on the green side and feed them to the stock, without threshing, to great advantage. Some, who are always ready to find an excuse for not attempting anything unusual, will say: "It is no use sowing without manuring the land and I have no manure," but such should remember that we are in position which demands an extraordinary effort and that every pound of forage next winter will be of unusual value.

There is no doubt, but on reasonably good land where the grass has failed, a fairly remunerative crop of oats may be grown without manure, for as we know oats are not grass feeders and remove less manurial value from the soil then almost any other crop.

One essential, especially, is good ploughing, if the land is badly ploughed, the sods turned over and laid flat as pancakes, the air will not act upon the soil and assist in decomposing the vegetable matter it contains, which would be thus converted into a valuable fertilizing material for the growing crop which, in the absence of manure, would be of greater importance. The consequences of good or bad ploughing are too often overlooked but in this case would be unusually great.

A top dressing of nitrate of soda would of course greatly benefit and hurry the growth of the crop, and it would obviously be better to make a little sacrifice to procure some than to have to scrape together every cent next winter and spring to buy hay at, very likely, a fabulous price, to keep the stock alive, or else to have to dispose of them to a great disadvantage.

There are other crops that may be grown for the above purpose, as for instance, Rye, Barley and Indian corn, but upon the whole we think that oats will be the most suitable on account of their rapid growth, present low price of seed, and the fact that they do not require such rich land to produce what is required.

At all events these peculiar circumstances demand peculiar thought and action, and those who adopt some method to obviate as far as possible the danger scarcity which is threatened, while yet there is time, will be the gainers, while those who sit supinely down and submit without any effort will suffer the effect of their indifference and neglect, and wish they had done otherwise when it is too late.

GEO. MOORE.

Some lessons can be learned from the present disastrous state of the meadows, chiefly, that where the aftermath has been eaten off bare in the fall and nothing left to protect the roots, they have invariably perished.

FARM WORK FOR JULY.

What says the old Georgia Negro-rhyme?

"Oh, July! Dis long time!
Dis long time! Oh, July!
Oh, July! Dis strong time!
Dis strong time! Oh, July!"

Nonsensical enough, we dare say, but, no doubt, the negrees, in the old slavery times, found working in the hot July weather, in the Southern States both "long," and requiring a "strong" man, both morally and physically, to stand it. And so it must be under the rays of our more Northern sun, for, to use a common English phrase, it is "precious hot" in the sun in this month and in this province.

THE COWS require great attention during the whole of the month, to prevent their falling off in their yield. If any farmer trusts to an old meadow, as pasture sufficient for his milch-cows, during the great heat and its generally accompanying drought; and can bear to see, as we have often seen and groaned over, the poor things striving and riving at the stems of a few sparse timothy roots, in a vain endeavor to fill their defrauded bellies; such a man deserves no commiseration if, at the end of the season, he finds the balance of his books against him.

For there are so many ways of supplying, at a moderate cost, the wants of these creatures, to whom, all unconscious as they are, we owe a reciprocal debt of gratitude for the benefits we receive from them. The earlier sowings of the mixtures of oats, pease, and tares we have so often recommended should be now in bloom and therefore just in their best condition; the second cut of clover, that has been once mown for green-meat in mid-June must be now well advanced; and, if nothing else is to be had, the farmer ought not to grudge breaking in upon his timothy hay-crop, rather than see his cows lack food.

And, while seeing that the cows have plenty to eat, do not forget that if they are allowed to wander about, in torment from the attacks of the horn-fly, all the food in the world will not enable them to yield a good flow of milk. Housing them all day and pasturing them at night, is about the best plan to pursue in places where the fly is really troublesome; and I may as well say at once, en passant, that the fly is, generally, only troublesome in undrained land, where, like at Sorel, in spite of the dry, sandy appearance of the top-soil, the water lurks underneath it, at a depth of not more than from two to three feet.

At any rate, if there is nothing for it but day and night in the pasture, some prophylactic should be tried, and the best we know of at present is a mixture of coal-oil and strong soapsuds, with which the cows should be rubbed over at least every four days. A combination of carbolic acid and any cheap oil would also answer, or even oil alone.

The natural history of this fly is as follows: The eggs are laid in the droppings of the animals, and are hatched in a week from their deposition. They then burrow in the ground, whence they emerge after having remained buried for another week, in full readiness for mischief. Therefore, the use of the bush or chain-harrow may be recommended for the purpose of scattering the droppings, and thus depriving the tender, though malevolent, little flylets of the shelter necessary to them at this stage of their existence.

Or a small boy, with a stout hockey-stick, might knock the dung about, not only to the injury of the flies, but to the prevention of those unsightly patches of rank, exuberant grass, that invariably spring up in the spots where the dung has been allowed to remain, and are never eaten by the stock until they have been acted upon by the frost.

But, there is one consolation at hand: entomologists predict, with what certainty we know not, that the horn-fly will before long disappear. Its ravages are decidedly decreasing in severity, and when it goes, no one will lament its departure; we devoutly wish, however, that in whatsoever direction it takes its flight, it would persuade its friend and relation, the turnip-fly, to accompany it.

THE FLOCK.—And while we are attentive to the needs of the cows and their protection from their enemies, we must not forget that the sheep require the same care. Not much grass left by the middle of the month, so the careful flock-master will have provided special supplies especially for the tender sheep, who must not be allowed to "look up and be not fed," as Dryden says. An acre or two of rape and tares mixed, to be followed by rape sown alone, will help the flock along during this month, when every other description of green thing, except corn, is burnt up. If sheep are worth keeping at all, they are worth keeping well, particularly as regards their wool: for, as every flock-master ought to know, there is a distinct break in the growth of each fibre of the wool at every alternation of full food and partial meagreness of keep.

THE HOGS are still, we must hope, revelling in the enjoyment of their clover-field, (1) whether on the ley itself, or on its produce carted into the yard. Keep in remembrance the fact that lean meat is the sort now sought after, and that, as the market, so must be the goods; though how any one can care for a lean ham, we do not understand: it is always hard and hard pigmeat is, to us at least, abominable.

THE HORSES have now a long period of down-right hard work before them, in the mower, the reaper, and the harvest-waggon; so, if you are an honest man you will not cheat them out of well earned provisions, particularly with oats at 25 cts a bushel.

THE ROOT-CROP will now need great attention, to keep down weeds, pulverise the soil, and finish the singling of the mangels, and early sown swedes. Keep the horse-hoe going; a thorough horse-hoeing is almost as good as a shower of rain on your swedes; mangels can stand longer droughts. And do not be afraid of letting the hoes go deeply into the ground. We always sought to reach, if possible, five inches, as we felt sure that, in our dry summers, the deeper the layer of pulverised ground, the more completely would the plants be at liberty to continue their unimpeded growth; an immense benefit, when we remember that impeded growth in a turnip or a swede means "mildew" and mildew means stringiness and loss of quality.

Horse-hoe close up to the plants, and use curved side-hoes for the purpose. Pull down the raised drills, so as to make the land level all over the field, and never earth up roots, except in the case of sugar-beets, none of which are likely to be grown in this part of the world. In moist climates where the swedes stay out all the winter, as in the N.-Britain, it may be well to leave the drills at their original height and to earth them up, so as to allow the water to make its way into the ditches; but nothing of the sort is needed here, and the confining of the root-lets to a space of a few inches wide, when they might be revelling in the whole extent of a couple of feet or so, cannot be wise.

POTATOES should have just earthing up enough to prevent the young tubers from greening, and not a particle more. However, we are glad to see no more of those vast mounds, made by the hand-hoe, that were so prevalent here some twenty years ago

HAYING.—In the neighborhood of Montreal, the clover ought to have been all in cock by the time this No. of the Journal reaches its readers, and there is no great art in making timothy hay. Only, cut early, in spi[te] of the dust, unless you are intending to supply the towns, in which case, you must cut as suits the consumers, and if they want seed and hay, all in one, why you must let them have their hay in that condition; if they pay, they must take their choice.

When clover is nearly made into hay, it, like all leguminous plants after being partially dried, is very easily spoilt by a shower of rain. For the half-made hay must of necessity be dried thoroughly, and in the turning to dry it, the leaves are knocked off and nothing but the bare stem and the flower remain. So, we advise all who have a silo to put their damp half-made clover into it and save themselves the double loss of time and leaf.

BARLEY.—The month of May, this year, was so cold, with so much easterly wind, that the harvest must be late, and this may lead some farmers to be impatient and to cut their barley too soon. Of course, if the grain is intended to be ground for stock, it signifies very little whether barley is dead ripe or not when harvested, but, if it is intended for the maltster, barley must, emphatically must, be allowed to stand till it is perfectly matured. As for the reason, we have often given it in this periodical, but a repetition of it will do no harm: The great object of the maltster, in the management of his "pieces," is to get all, or as many as possible of the grains of barley to grow at the same rate, in order that they shall be all ready for the kiln at the same time. Now, readiness for the kiln is determined by the progress the "acrospire," as maltsters term it—the plumule or a green stem that is to be when it emerges from its sheath—has made up the grain towards its point of exit. Now, any one can see at a glance that if one grain is dead ripe, and its neighbour in the "piece" only ⅞ ripe, there is not much chance of their rate of growth being equal; therefore, when the ripe grain is fit for the kiln, that is, when the conversion of the starch is as nearly complete as possible, or in the brewer's language, the grain is "malted," the conversion or malting of the unripe grain is only partially completed, in other words it falls off from perfection by one-fourth, thereby causing not only a loss of flavor, in the ales brewed from it, but also lessening the quantity produced.

Therefore, though oats and wheat may be, and ought to be, cut on the green side, let your malting barley stand till is is dead ripe.

RAPE.—As it is pretty certain by this time that there will be but a poor yield of hay and that straw will not be over abundant, it will be advisable to keep stock out as late as possible in the fall. Milch-cows and horses must be housed early, but sheep, with their heavy coats, can stand a good deal of cold, provided there is not too much rain with it. Therefore, as soon as you see any old grass looking as if it would not do much more good, break it up at once, and put in rape. If this is done by the end of July, there will be a good bite for the sheep at any time from the first of October till the snow is too deep for the sheep to be out in it. Rape will stand a very hard frost without damage—9o or 10o below zero—, it is the alternation of frost and thaw that hurts it.

And this will not prove a costly job. A shallow furrow, 6 lbs. of seed to the arpent, and a plentiful use of the harrow before sowing, with a rolling afterwards, is all that is needed, unless the land is awfully poor. A trifle of pea-straw given on the ground, or, preferably, in racks, will help the sheep vastly. It is a pity pea-straw is always so full of grit and dirt, as it spoils the knives of the chaff-cutter, if one attempts to pass it through that implement. We have sown a mixture of rape and Hungarian grass, for our cows, in October, and they did well on it, as the frost-touched grass prevented the rape from bloating the cows and caused no scouring.

(1) Alas! Very little clover this year! Ed

The Dairy.

AGRICULTURE and THE QUEEN'S REIGN.

Dairying local—Old methods The Oxford meeting of the R. A. S.—Butter science-work.

CHANGES IN THE DAIRY

When the Queen came to the throne in 1837, dairying occupied a most important place in the agricultural system, but one that was chiefly in England confined to certain counties. Everywhere a little butter was made, but the chief dairy districts of Great Britain, were found in the western half of the island.

Devonshire butter, and Somersetshire, Gloucestershire, Cheshire and Stilton cheese were well known, and represented a most important manufacture. I do not name these special districts because they stood alone, for every important valley in the pastoral portions of England, Wales, and Scotland possessed farms, where the products of the dairy, were matters of justifiable pride, and on which the three cardinal principles of successful dairying—method, carefulness, and scrupulous cleanliness—were rigidly adhered to.

There is no doubt whatever on this point; the wonder is that it should have been so. Of all our appliances of to day, The dairy farmer of 1836 knew nothing All his apparatus and utensils were of the crudest character, and it was not until her Majesty had been on the throne for three years that improvement in these commenced.

As the first notable invention of the Queen's reign was connected with cheesemaking, it may be worth while to briefly describe an old cheese dairy. In the first place the cattle were of a very poor stamp, so much so, that it was estimated the dairy cows of the whole country, averaged less than 380 gallons of milk each, per annum, although Somerset, Yorkshire and Lincolnshire were each noted for their special breeds which gave more than this quantity. To-day there are in every corner of England, a race of unpedigreed dairy-shorthorns, which are famous for their milk yields, so that we may take it every dairy herd in that country, gives an average of 500 gallons of milk, per cow per annum, and many up to 600 gallons. The manufacture of milk into cheese was, compared with the present time, a drudgery. The milk was "set" in large wooden tubs, and the "cutting" of the curd, the draining off of the whey, and the salting were all done without any special appliances. The cheese press was a very primitive affair. In a few cases, the press was one with a wooden screw, which was worked by a bar. These, however, were only in very advanced dairies.

In most cases the cheeses were moulded and put into a press which consisted simply of a board on which a number of large stones were placed as weights. From first to last cheese-making was thus a matter of sheer hard work.

It was at the first show of the Royal Agricultural Society, held at Oxford in 1839, that the first improvement in dairy utensils was shown; Mess. Carson and Co., introducing a light iron lever press, which now almost in its original form, is nearly the best. Very soon after tin utensils came into use, and then somewhere in the fifties, a steam-jacketted cheese vat was introduced, and was very popular, and was the pioneer of the many excellent cheese vats in use to-day. Then at various times little improvements have been made in other utensils, more especially for lessening labor. The use of the thermometer seems to have been advocated for the first time, in the fifties too, but even now a great deal of cheese is made without its use.

It is in butter-making however, that the chief changes in dairying have occurred. Those effected in regard to cheese making involved the application of no new principle, while those in butter-making have involved several. In 1837 butter was made over the greater part of Great Britain, in almost the same manner as in the times of the Romans The milk each day was "set" in shallow pans, and allowed to stand for some days in a cool dairy in order that the cream might come to the top. When "ripe" the cream was taken off, and churned in an upright wooden churn, by means of a dasher worked by hand. This churning took place either once or twice a week according to the size of the dairy. The butter was then made up into pats or rolls for market, and in only a few cases was there any washing, or working beyond what it received in the churn. In Devonshire, however, butter was made then, as now, from scalded cream and by the hand and tub system, in which even the churn itself was dispensed with. It is curious to find that not only does this old custom largely survive, but also, under some conditions, gives better results than those obtained by our more modern methods, while the scalding destroys the recently found bacteria, helps the keeping qualities, and does not injure the flavor or texture. Thus 1837 and 1897 alike bear witness to the excellence of one of the old agricultural systems.

The growth of large populations in cities, brought about an enormous demand for dairy produce, and so in the sixties, dairy matters occupied a good deal of attention in England, and abroad, the latter more especially in butter making. But in regard to this, it was in 1877 that some tests were made with a new machine, destined to

revolutionize dairy work. This was the centrifugal separator, invented by a swedish savant, Dr de Leval. What this at the outset was expected to do, one could scarcely credit, and yet it has since done far more than the most sanguine expected, until now we have a machine, that not only separates the cream from the milk, but makes it into butter in the one operation. These are the inventions that have revolutionized actual practice, and that have effected vast economic changes, chiefly tending towards dairy manufactures on a vast scale in comparison with those of the farm house. Towards the end of the fifties cheese factories commenced operations in the States, and quickly became successful, and then attempts were made to establish them in England, but with no great amount of success.

During the past twenty years, the chemistry and physiology of milk, and its products, have received an amount of attention, that has never before been approached at any previous time, and the result has been the discovery, that in every stage of milk production and manufacture, it is affected by different bacteria, or minute living organisms, and that it is to the destruction or control of these, that success, flavor, keeping qualities, and a thousand and one little things are due. But after all, the moral of this discovery is but this. That our grandmothers were right, in their insistence, that the secret of good dairying is regard to scrupulous cleanliness, accuracy of method, and carefulness. And in the great majority of other researches, it has been found, that there was a good deal of reason underlying old established methods of both cheese and butter making.

That both these products are now turned out of a more uniform quality than formerly is certain; but it is very doubtful if England, the market for them, produces more of either to-day than she did 60 years ago, though her population has increased more than fifteen millions in that time.

W. R. GILBERT.

THE COW AND HER DRINK.

If a dairyman wants to treat himself to a genuine surprise, let him keep his herd of milk-giving cows in the stable, and give them water in such a way that the weight drunk by each cow can be ascertained, and be on hand so that each cow may have all she will desire, and when she wants it. We have been through a little experience of this kind, and the quantity drunk by each cow was found out. It is an experiment one will not care to follow up more than a week, before the faucet at the big tank will be turned, and the cows drink out of the basins again. The trial was made with six cows, and it was found that the average quantity consumed daily varied with individual cows from 70 to 140 lbs. One cow drank this last quantity daily right along, and some the smaller quantity, with an average of 90 pounds each.

Another thing we found was that some of the cows would drink very often, i. e., their buckets would be frequently found empty, and others drank at longer intervals; and one cow wanted about all her 24 hours' supply at one time, and would only drink a little towards night. As these cows were being fed 50 pounds each of ensilage a day, it is seen at once that succulent food did not play any important part in the economy of drinking water. (1) It was also found that the desire of a cow for water was about an hour after eating, but the evening thirst was never so great as in the morning. With some of the cows there was some variation in the quantity of water consumed daily, but with others it was as steady in quantity as standard measure. In this there might be some variation in results from some other herd not so cared for; these cows being continuously stabled at the time of the experiment, while a herd that ran out-doors more less might show different results.

In another thing I was convinced, that a cow did better that drank several times a day, and so convinced was I of this, that a watering system for the cow stables was put in several years ago; and my opinion of their value has never changed, more than a more thorough belief in their promoting the milk flow; and if our cows were to be turned out every day for exercise, I should not connect out-door drinking with it, but hold to the manger water basin. In this connection there is another point I think of importance, and that is in stable watering there is uniformity of the temperature of the water, and the cow, being habituated to drinking water at say 52o day after day—as the water in my big stable tank indicates—is not subjected to the extreme temperature ranges of out-door drinking water, and air included, and she must do the better for this uniformity, with the shocks to the cow's system eliminated.—

JOHN GOULD in "Gentleman."

HINTS ON LIVE STOCK MANAGEMENT.

FEEDING AS AFFECTING YIELD OF MILK.

That milk is derived from the circulatory system is capable of direct proof. The digested food must pass into the blood, and from the blood comes the milk. It is not necessary that milk should be immediately produced from nutrient matter thrown into the circulation; for it is clear that heavy milkers lose flesh, and milk is then derived from the stored-up fat and muscle of the body. Milk is a natural provision for the offspring, and Nature requires that the provision shall be made even at the expense of the mother, if sufficient aliment be not supplied. It is known that the variation in quantity and quality of milk is, in a great measure, an individual or a racial peculiarity. Some cows run to milk and others to flesh. Some races are peculiar for milking powers, while others are famous for yielding butter, as in the case of Jerseys, or cheese, as in the case of Ayrshires. Others give large quantities of comparatively poor milk, as Dutch cows. These racial peculiarities are modified in each individual cow, so that what may be said of races may be as truly stated of individuals. It is often asserted (and we do not doubt the fact) that food produces less effect upon quality of milk than the race or the personal idiosyncrasies of the cow. Experiments made upon feeding cows appear to prove that these broad principles are correct, but their practical utility is interfered with by the important consideration that after all a starved cow cannot continue to give milk.

(1) Fattening beasts with a bushel of roots a day do not want water. Ed.

It is also clear that the volume of milk must depend upon the volume of food, under certain limitations; and that a liberally fed cow will treat her owner liberally. When grass fails, so does the milk, and when the herd is turned into a new and fresh pasture, the yield of milk immediately rises. Even granting that the composition of milk is more dependent upon the individual properties of the cow than upon the food supplied, the quantity and quality of the food is still a first-class factor in milk production; for, "caeteris paribus," if we increase the volume of milk we most assuredly raise the solids, unless the increase is only water, which is not at all likely.

Before any idea can be formed as to this effect of food on the quality and quantity of milk it is necessary to understand how milk is formed. The primary cause of the flow is well-developed milk glands, without which no food would be of any value for the purpose. The action of the milk glands is remarkable, and has been shown to differ from the acts of secretion or excretion performed by the salivery or or urinary glands. It appears to consist in an absolute liquefaction of the gland itself. According to Wolff "they absorb material from the blood capillaries and lymphatics, and by the disruption (liquefaction) of the epithelial cells which line the interior of the milk glands milk is produced." Milk production is evidently a matter between the blood and the milk glands. The blood contains no casein, and sugar is not supplied to the gland by the blood, but both are derived from the gland itself through decomposition of materials supplied from the blood. It appears, therefore, crude to state that a food such as barley meal dries up the milk or that "there is milk" in a food. It is impossible to conceive any other source of milk than what is handed over to the mammary gland through the blood capillaries and lymphatics, and these materials are organized in the gland and afterwards decomposed and liquefied, and appear as milk globules. According to the peculiarities of the cow the amount and character of the milk will vary, and hence the "dictum" is arrived at that the food supplied has less effect upon the milk than the peculiar action of the milk glands. Secondary in importance as the food may be in comparison with the primary necessity of the milk glands, it is nevertheless certain that the quantity of the milk must depend upon the food. It seems purposeless to state that the food has less to do with the production of milk than the cow, and might be paralleled by a statement that as muscle is the primary cause of strength, food has comparatively little to do with strength. A cow's milking properties, both as regards quantity and quality, depend first upon her glands, but at the back of all milk production lies the feeding. Thus Wolff says, "Diet is only a secondary consideration in milk production; but at the same time, the manner and extent of the feeding have a very marked effect on the quantity of milk produced." Thus, in spite of recent utterances as to the comparative importance of racial or individual aptitude as against special feeding, there is still much practical value in the old saying that "milk goes in at the mouth."

It is necessary that a cow should be kept up in condition if she has to continue to milk well, and this clearly shows that food which will fatten a bullock will induce a cow to keep up her flow of milk. Fats and albuminoids, as found in oilcakes, are the best means of supplying the materials of butter fat, and casein to milk, which are formed at the expense of the mammary glands from the blood, although as already stated casein, as such, does not exist in the blood. Absolute experiment has shown that additional fat in the food increases the yield of milk without impoverishing its composition. In other words, the yield of butter-fat is increased by fat in the food. On what grounds, then, can it be stated that "starch and sugar, which are fat formers," are unable to increase the fat in milk, even if they have first to be stored as fat in the body; and, afterwards, through the lymphatics, find their way within the sphere of action of the milk glands? As to the albuminoids of food, they pass into the circulation as circulatory albumen, and directly reinforce the secretive power of the milk glands, and hence milk cows should be supplied with a higher ratio of albuminoids than is necessary for fattening bullocks. A sufficient amount of circulating albumen is especially necessary for obtaining and maintaining a high yield of milk. If cows are not liberally fed with materials containing both fat and albuminoids, the flow is maintained at the expense of the flesh and fat of the body, and thus it is simple necessity that cows should be maintained in condition, and the lactic flow will then be maintained in full force. The quality of milk has especially been stated to be uninfluenced by food, but this is a matter of minor importance if quantity can be increased while the composition remains unaltered. Even a large supply of water often increases the yield of milk, without reducing its quality. It appears extremely difficult to alter the composition of milk by feeding, and numerous experiments could be at once adduced to show that the composition of milk has remained the same whether the cows received barley meal or oilcake. Oilcake, however, through its richness in albuminoids and fat, decidedly increases the yield, and this appears to practically clinch the question as to whether the yield of butter per cow may not be increased by judicious feeding. Quality of milk is, however, not altogether a question of butter-fat or cream, for the influence of food upon the texture, flavor, and keeping properties of both butter and cream has been fully proved. Cows fed on food poor in nitrogen, such as meadow hay, give a tallowy butter of poor flavor; while if a little oilcake is added the soft and oily fats are increased. Thus what has often puzzled practical men in scientific statements as to the impossibility of altering the composition of milk by feeding may be disposed of without impugning the practice of cow-keepers. Cows must be liberally fed, and cotton and linseed cakes will still maintain their position as foods rich in albuminoids and the soft fats or oils. Starchy foods such as barley and rice meal also keep up the condition of the cow, and thus enable her to fulfil her functions as a milk producer. It is, however, valuable to know that albuminoids are of vital importance to cows in milk because they keep up a full supply of circulatory albuminoids in the blood, which as it flows through the milk glands is decomposed into casein and even into fat.

"Ag. Gazette.

W.

THE INFLUENCE OF FOOD ON THE MILK OF THE DAIRY COW.

(The article which follows, was written by Mr. H. B. Rice, of Lewiston, Ill., one of Prof. Henry's second year Short Course boys at Madison. The writing of these essays is a part of their regular drill, and every member of the class wrote upon this same topic. Prof. Henry tells us that a large proportion of the essays possessed real merit, but Mr. Rice's was adjudged the best, and was awarded the Professor's prize, of $10 in gold.)

In taking up this subject, one naturally inquires in what different ways the food might effect the milk or its products. In the following pages I shall attempt to discuss the effect of the food on the quantity of milk given by the cow, on the composition of the milk, as to fat and other solids, on the churnability of the cream, on the flavor of the milk and butter, and on the hardness, or melting point, and the color of the butter.

First, I shall take up the relation of the food to the quantity and composition of the milk. Numerous experiments have been made to study the effect of the nutritive ratio on milk production, the results of some of which are briefly given below.

In summing up a number of experiments at the Wisconsin Station. (R. IV p. 158, with rations having a nutritive ratio varying from 1:12.1 to 1:5 as well as some work done at the Maine and Massachusetts Stations, on the effect of the nutritive ratio on milk production, Prof. H. P. Armsby states, "that the greater the proportion of digestible protein in the food, the more milk a pound of that food will produce." An experiment at the Maine Station, (R. 1886-7) the following year, with four cows, resulted in an increased milk production from the narrow ration. In none of the experiments at the Wisconsin or Maine Stations referred to above, did the nutritive ratio of the food appear to effect the composition of the milk in any definite manner.

At the Ontario Station. (R. 1892, p. 204-207) experiments were carried on in 1891 and 1892, to compare a ration of coarse feeds, poor in protein, with rations of more concentrated feeds, rich in protein. In 1891, six cows, divided into three lots, were fed in three periods, of four weeks each, so arranged as to eliminate from the average results, the changes caused by the advancing period of lactation. The rations used were: No. 1, ensilage, 50 pounds; oat straw, 30 pounds; cut hay, 10 pounds; nutritive ratio, 1:15.6. No. 2, cut hay, 20 pounds; linseed meal, 4 pounds; cotton seed-meal, 5 pounds; nutritive ratio, 1:3.9. No. 3, cut hay, 20 pounds; pea meal, 4 pounds; oat meal, 5 pounds; corn meal, 8 pounds; nutritive ratio, 1:6.8. The total milk yields per week, were: On ration No. 1, 921 pounds; on ration No. 2, 1227 pounds; on ration No. 3, 1,353 pounds. In 1892, six cows were divided in two lots, fed in two periods of five weeks each. The rations were: Ensilage, 50 pounds; bran, 1 pound; hay, 5 pounds; and ensilage, 50 pounds; pea meal, 5 pounds; oat meal, 3 pounds; barley meal, 2 pounds; hay, 5 pounds. In both experiments each cow was at some time fed each one of the rations. The results in '92 were in harmony with those of '91. In neither experiment was the per cent of fat in the milk affected to any extent by the feed, but both years the solids not fat, decreased on the poor ration, the average of both trials being, on the abundant ration, 9.03 per cent solids not fat, on the poor ration, 8.69 per cent, a decrease of .31 per cent. The cows lost considerably in weight on the poor ration, and gained on the more abundant.

John Spier, of Glasgow, (Trans. of the High. and Agr. Soc., 1891, p. 108) concludes, as the result of feeding cows on pasturage, brewers' grains, potatoes, etc., with bean meal, cotton seed meal, barley meal and linseed meal, that "although the quantity of milk is easily influenced, up to a certain point, by the food supply, the quality is not altered by any ordinary mixed food. The percentage of butter fat, is very little influenced by foods containing a large percentage of oil, such as linseed meal or cotton cake, nor yet by albuminous foods, such as bean or pea meal, decorticated cotton cake, etc. Highly albuminous foods have a slight influence on the solids not fat."

At the Pennsylvania Station. (R. 17) the substitution of cotton seed meal for bran in the ration, was accompanied by an increase of about one-fifth in the milk yield, with practically no change in the per cent of fat in the milk.

In a comparison of corn meal and gluten meal, at the New Hampshire Station, (R. 13) "in almost every case with each of eleven cows, a change from gluten meal to corn meal, i. e., from a narrow to wide nutritive ratio, resulted in a decided falling off in the milk yield, while the reverse change resulted in an equally decided increase."

A note worthy experiment was conducted at the Iowa Station (R. 14) from March 22nd, to June 9th 1891. Four cows, three of them grade Shorthorns from six to twelve years old and one four-year-old grade Holstein, were taken for the trial. The cows calved February 8th, February 26th, March 3rd, and March 8th, '91. Sugar meal, a by-product of glucose manufacture, much richer in protein and fat and poorer in carbohydrates than corn meal, was compared with corn and cob meal. The cows were fed, as nearly as possible, a uniform ration of 12 pounds corn fodder and 4 pounds clover hay throughout the whole time, together with either 12½ pounds corn and cob meal, or 10 pounds sugar meal. Three test periods of twenty-one days each were taken with ten days period between. The cows were fed in two lots of two each as follows, by periods: Lot one, corn and cob meal, sugar meal, corn and cob meal. Lot 2, sugar meal, corn and cob meal, sugar meal. The average gain, in milk yield on the sugar meal over the corn and cob meal ratio, was 7.9 per cent.

The average composition of the milk on the corn and cob meal ration, was 3.37 per cent fat, and 11.87 per cent total solids. On the sugar meal ration, it was 3.35 per cent fat, and 12.60 per cent total solids. The live weight was, practically, unaltered. An attempt was made to corroborate the above results by an experiment the following year, but for some reason the results were not so striking.

After a systematic study of the dairy herds, of Connecticut, sixteen herds being visited, and tested during the winter of 1892-1893, and six during the winter of 1893-1894, the Storrs Station report for 1894 states that, "In general there was the largest yield of milk, and the largest butter production on narrow rations, rich in protein." In the winters of 1893-1891 and 1894-1895 seven herds were tested for twelve days each, different rations suggested, and after from two to four weeks another twelve day test was made. In general, there was a larger yield, both of milk and butter, on the narrower rations. They suggest a ration containing 2.5 pounds of protein, and with a nutritive ratio of 1:5.6. In a soiling experiment, comparing cereal with leguminous fodders, those rations containing relatively large amounts of protein gave decidedly better results than the wider rations. (Storrs '95 p. 92.)

The New-York Cornell Station (B. 92,) made two trials, with five cows in each, of feeding tallow with the grain ration. The first five cows, at the beginning of the experiment, had been in milk from fifteen days to five months, averaging two months and seven day. During the early part of the experiment the cows were on pasture, receiving in addition, bran four pounds, and cotton seed meal four pounds, but during the last three weeks of the experiment they received ensilage and mixed hay with the grain.

The tallow period lasted ten weeks, during the last five of which, all the cows received two pounds of tallow per day. For the second trial, five cows from ten to fifty days in milk, were taken and were on winter feed throughout the whole time.

The tallow period lasted ten weeks, as before, and all the cows were on the full feed, of two pounds of tallow per cow, from five to seven weeks. The tallow was eaten quite readily with the grain. In each trial the milk was weighed and tested for two weeks after the tallow period. The conclusion given is: "In this quite extended trial there has been no increase in the fat, in the milk, by feeding tallow to cows in addition to a liberal grain ration."

At the New Hampshire Station (B. 29) an experiment was made in feeding cotton seed oil, corn oil, palm oil, cocoanut oil, oleo oil and stearin. The oils were eaten readily with the feed. Three cows were used in the experiment. The conclusions were: "The first effect of the increase of fat in the ration is to increase the fat in the milk, due to the unnatural character of the ration. With the continuance of the ration, the milk tends to resume its normal character."

Extended experiments have been made at the Wisconsin Station, comparing corn silage and dry corn fodder from 1882 to 1891. The results have not been always uniform, the milk being sometimes richer and more abundant on the ensilage, and sometimes the reverse, but the differences have never been pronounced. It was concluded (R. VII. p. 97) that "when properly prepared, dry fodder and ensilage possess very nearly equal value for milk and butter production.

At the Vermont Station (R. 1890. p. 203) an experiment was made with five cows, comparing ensilage with beets, and with three cows, ensilage versus carrots. It was found that a pound of dry matter in beets or carrots gave, practically, the same returns as a pound of dry matter in ensilage.

An experiment with twenty cows, ten averaging 209 days in milk and ten thirty-five days in milk, was carried through ninety-seven days at the Iowa Station (B. 25.) Cabbage was fed thirteen days, mangels (first period) twenty days, turnips eighteen days, mangels (second period) eight days, corn fodder seventeen days, and corn ensilage twenty-one days, in the order named. The ration for the herd was, corn meal 240 pounds, bran 100 pounds, hay 200 pounds, cabbage or roots 600 pounds. With fodder or silage the corn meal was reduced to sixty-five pounds, and the bran increased to 150 pounds. The average test of the herd milk fell from 3.62 p. c. fat on mangels to 3.37 p. c. on turnips, while the quantity increased one pound per head. The test rose again during the second mangel period to 3.55 p. c., was 3.89 p. c. on dry fodder, and fell to 3.50 p. c. on ensilage. The quantity of milk did not increase on the ensilage. The fat content of the milk decreased with eighteen cows on the turnips, and with seventeen cows on the silage.

In studying the effect of the change from barn to pasture in spring, the Vermont Station (R's. VI. and VII.) obtained the records of over 10,000 cows in northwestern Vermont, and also, in the spring of '94, conducted an experiment with twenty-one cows at the Station. It is stated that "the evidence appears overwhelming that cows on early pasturage give not only more but richer milk than during the last months of their barn life." The advancing period of lactation probably has much to do with the increased richness of the milk.

Experiments with warm vs. cold water for milch cows, at the Wisconsin Station, during two winters, (Reports VI. and VII.) showed that an increase in the amount of water, at a given temperature, drank, was associated with an increase in the milk yield, and a decrease in the per cent of solids in the milk.

It seems to be an undisputed fact that cows shrink in milk as the period of lactation advances, and with pregnant cows the per cent of fat and total solids increases. These changes are most rapid during the latter part of the milking period. The Vermont Station (R. VI.) found that the milk of farrow cows changed little, if any, in composition, up to the time of drying. Observations with fourteen cows (N. Y., Geneva, R. 1891) at the end of the eleventh month of lactation showed an average decrease in milk yield of 26 p. c., while the milk contained 10 p. c. more fat and 36 p. c. more casein than at first, while the milk sugar remained practically constant.

Stewart in "Feeding Animals," claims that by continued high feeding, through a series of years, the fat content of a cow's milk may be considerably increased, but there seems to be but little evidence to prove the statement.

To a certain extent the kind of food may affect the churnability of the cream, but, with the present knowledge of the temperature, and other conditions necessary for perfect churning, the effect of any food on the churnability seems unimportant (Wist, R. VII. p. 89; "Hoard's Dairyman," June 20, 1890, Prof. W. W. Cooke, of the Vermont Station.)

As to the effect of the food on the flavor of the milk and butter, in the experiment recorded in the Iowa Bulletin No. 25, when cabbage was fed the butter kept poorly, and scored only 38 out of a possible 45 for flavor, on turnips and on silage the butter scored 40, while on mangels and on dry fodder the butter scored 43. The turnips were fed after milking. In another trial, at the same station, (Ia. B. 32) the milk was badly tainted, with the flavor of cab-

bage and turnips, and likewise the butter, except when the cream was pasteurized. The manner of feeding the cabbage and turnips, in the latter case, was not mentioned.

Rye pasture often gives the milk and butter a distinctly bad flavor. The effect of onions and garlic is well known.

That certain foods affect the hardness or melting point of the butter is generally known. In a Texas experiment, (B. 29) two cows advanced in lactation, and two fresh in milk, were changed from a ration of corn meal, bran, and silage, to one mainly of cotton seed meal. On a ration of one-fourth cotton seed meal the melting point of the butter was raised 2.1o F., and on three-fourths cotton seed meal it was raised 7.2o F. Numerous experiments at other stations confirm the above. (N. Y., Geneva, R. '89; Ala. College Sta. B. 25. sc. ser.; Penn. B. 17). Linseed meal (N. Y., Geneva, R. 1889, p. 112) is said to produce soft butter; likewise gluten meal, (N. H. R. B. 13) while corn produces a harder butter.

Turnips, at the Iowa Station, (I: 25) produce a colorless butter, while mangels gave a well colored butter. Cotton seed meal, at the Texas and Pennsylvania Station (Tex. B. 11; Penn, B. 17) injured the texture and color of the butter. Butter from cows on June pasture is quite different in color to that from the same cows on grain and hay in the winter.

In conclusion it may be stated:

1. That it seems clear that the quantity of milk given by a cow is quite easily influenced by the amount and kinds of food used in the ration.

2. That, although there are a few notable exceptions, the weight of the evidence seems to warrant the statement, that the individuality of the cow is the main factor in determining the composition of the milk, while the food has very little, or, at least, a very uncertain, effect upon it.

3. That the effect of the food on the churnability of the cream is unimportant.

4. That certain foods impart to the milk and its products peculiar flavors, although it is uncertain how far skill in feeding may avoid these flavors. (1)

5. That the hardness and color of the butter are varied by certain changes in the food.

"Hoard's."

(1) Raise milk to 160o F., after feeding turnips, etc., directly after milking, and adding a little bit of salpetre.—Ed.

DEVONSHIRE BUTTER.

To refer again to the question of butter-making, it is within the memory of the reader that a few weeks ago a report of a butter-making experiment in Devonshire appeared in these columns. It seemed to have been the wish of the county authorities to test the relative merits of the local custom, and of what some term the modern system of butter production; consequently eighteen lots of milk were subjected to a variety of tests upon different systems. In six cases the cream was scalded in the old-fashioned way, and subsequently stirred into butter with the hand. In three cases raw cream was raised upon shallow vessels and churned, the remaining nine lots of milk being divided into three lots, which were scalded—separated and the cream churned; raw separated and the cream scalded; and the cream scalded after raising by gravitation and churned. My object in calling attention to this matter is not so much with the view of criticising the remarkable decision at which the Committee arrived as of pointing out the desirability of further tests in creameries or factories with regard to the influence of scalding upon the keeping properties of the butter during hot weather. The largest quantity of butter was produced by the separator first from the raw cream and then from the scalded cream. There were three judges, who disagreed, as it appears, so seriously that the Committee which carried out the experiment appears to have made the awards in accordance with the opinions of one of those gentlemen, who hailed from Devonport, and who selected the whole of the six samples made by the hand for the six prizes which were offered. I prefer to refer to the opinion formed by the analysts, Dr. Dyer and Mr. Lloyd, who, though not appointed as judges, except as to condition of the butter from the scientific point of view, agreed perfectly in their opinion that the butter produced from the raw cream kept better than the butter made from the raw cream; selecting for first places the churned scalded-cream butter and the scalded separated cream butter. There is a great deal more in this than appears upon the surface, and with an experience of scalded cream butter, which dates back for many years, I think it will be found that, where the principle of scalding is carled cut in butter-making, quite apart from the Devon system, the butter will be found to keep longer, and consequently to realize a better price during the summer lize a better price during the summer communication of the peculiar flavor which Devon men admire, for with sufficient care while churning, and the careful removal of the butter-milk by washing, that flavor may be immensely improved upon. The figures of the analysis, for example, are some proof of this well-known fact, for the butter made by stirring scalded cream contained 16-7 per cent. of water and 1.1 per cent. of casein, whereas the scalded separated cream contained only 11.9 per cent. of water and 0.5 of casein, while at the same time it produced more butter—7 lb. 13¾ oz., against 7 lb. 10½ oz where the hand was used. The Devon system has so much to recommend it that it is disappointing to read the report of an award made on such a basis as that to which I have referred, for not only was the prize butter—as the figures have shown—much the most heavily fortified with water and curd, but it only took third place in weight, and, as for flavor, that is entirely local; and although they acquire and even admire it in Devon, it is repudiated upon every great butter market in the country.

JAMES LONG.

CHANGED CONDITIONS.

The demand for Cheshire cheese is cheering to those who have been waiting for a revival of trade. The price has improved, and it is to be hoped that the supply of good cheese will be equal to the demand. The evil days have been effectual in stirring up cheese-makers to adopt scientific methods, and, the remedy having been found and correction made, they are now reaping the fruits thereof. Conditions have changed in every department of the farm and dairy at home and abroad. Dairying is now an important factor in Australia, as well as wool; and in the States Canadian Cheddars are highly favored, in the interesting report presented to the U. S. Department of Agriculture, Major Alvord gives an historic account of the rise and fall in American dairy products. Every British farmer may not be aware that for over a century the States have exported cheese, and for many years it enjoyed a well-earned reputation. It commanded a higher price in Europe, and was eagerly sought after. But all this has been changed, owing the altered conditions and devious ways. The States formerly supplied Canada with a large quantity, but has decreased from 118 million lb. to 60 million lb. Up to 1895 a number of foreign merchants had agents in New-York in order to buy American cheese, but the foreign buyers seem to have disappeared. At one time American cheese was all the Canadians consumed, but now the Dominion make all they want and export the surplus. In recent years Canadian cheese has taken a firm hold in the foreign markets, and this is solely due to the changed conditions of American practice. It seems that some cheese makers extracted some of the cream from the milk before making cheese, and hence an inferior article was the result. Then after "a little cream had been taken out and turned into butter it was easy to take a little more, and the downward plunge to skim cheese with no cream at all was soon made." Therefore, the American market was ruined by sending cheese made of skim milk, while the Canadian supplied the real Simon Pure, which was eagerly bought. "Filled cheese," however, gave fatal blow to the American.

DELTA.

THE CURING ROOM

A building well lined with paper, and given an outside covering of the same, is better than one that is plastered. The paper is a better non-conductor of heat than is plaster, and there is no stand or grit, such as will sometimes fall from a plastered room. Have the curing-room on the ground floor, and at the north side or end of the building, then, if there are wide eaves, the direct rays of the sun strike the room only in the morning and evening. A shingled roof is cooler in hot weather. In very hot weather, cheese only ten or fifteen days from the press may be boxed and placed in a dry cellar until wanted for market, or they may be allowed to age a little more and then be placed in cold storage. The slow even ripening of a cheese, especially when nearing maturity, gives it the full, true flavor. In the early part of the season, there is a tendency to hasten the ripening. When this is done, there should be a regular order of changing those near the stove for those more distant, and from the upper to the lower shelves. Steam heat is most excellent in early and late curing. In hot weather, leaving the windows opened at night will change the air, lower the temperature and admit sufficient moisture. In the morning the room should be closed and darkened. A ventilator in the ceiling that can be opened and closed at will is often a great service. When there is a cooling shower, the rooms may be opened for a few minutes. This question of moisture and ventilation must be governed largely by good judgment and thoughtfulness.

IMPORTANT TO HUMANE FARMERS.

TO PREVENT A COW FROM MOURNING FOR HER CALF. (1)

During a recent sojourn in Scotland, being frequently invited by "Jeanie," the dairymaid, to come to the stable at milking time, I became well acquainted with Primrose, Buttercup and Daisy, and on one occasion, I noticed a very young calf (belonging to them) in a loose box at the end of the stable, and remarked to Jeanie that I was surprised to see her milking the cow when the calf was so young! That at home in America, we always let the calf have all the milk for a week or more, and then fed it with skimmed milk, warmed, etc. But Jeanie smiled and said: "We never let them draw the milk at all in Scotland. As soon as the calf is born, it is put in the loose box, with plenty of hay or straw bedding, and fed with all of its mother's milk while warm from the cow. This is kept up for some time, (I do not remember just how long) and then the calf is fed with skimmed milk warmed and thickened with oatmeal, or other ground food.

And when the time comes to take away the calf, there is no distress on the part of either cow or calf, by means of this simple and excellent plan.

LUCY F. FAWCETT.

BUTTER-MAKING TRIAL IN DEVON.

The report of an investigation into the relative merits of different systems of butter-making carried out by a subcommittee of the Devon County Technical Education Committee in the last week of November, under the superintendence of Dr. Bernard Dyer and Mr. F. J. Lloyd has only just been published. The trial lasted six days from the beginning of the milking to the end of the butter-making, and the quantity of milk used for each of the eighteen experiments was 200 lb. The primary object of the investigation was a critical comparison of the Devon tub-and-hand process of converting scalded cream into butter with the use of the churn under like circumstances: but it was extended so as to embrace comparisons with other processes. There were six experiments with the tub-and-hand method, three with the churning of cream scalded on the milk in Devon fashion, three with raw cream raised in shallow pans, three with raw separated cream, and three with scalded separated cream. The milk was carefully mixed before being distributed to ensure equality.

The tub-and-hand process may be briefly described for the benefit of any reader not familiar with it. The milk is allowed to stand in shallow pans for about twenty-four hours, after which the pans and their contents are heated in a special scalder or otherwise until a thick layer of clotted cream is formed on the top, the stage at which this process is complete being usually judged by the eye, though 160 deg. Fahr. may be given as the right temperature for scalding. The pans are

(1) This we have recommended for the last 50 years. We learned the plan from "Jessie Buchan," our Aberdeenshire dairymaid in England.—Ed.

next returned to the dairy to cool and to stand for a second twenty-four hours, after which the clotted cream is skimmed off, placed in a tub, and stirred and turned with the hand until converted into butter. Scotch hands, or a bottle filled with warm or cold water, according to the period of the year, may be substituted for the human hand; but the latter was used in the trial under notice, as it is in the great majority of Devon dairies. In trying the churn against this method, the cream was treated precisely the same before being made into butter. The milk used was all morning's milk of good quality, the fat averaging nearly 3.65 per cent. The time occupied in getting the butter by the tub and-hand process averaged 45 minutes, against 37 minutes by the churn. The two analysts, whose report is a very careful and complete one, give the following among other results of the different processes:—

	Butter.		Percentages.		
	lb.	oz.	Fat.	Water.	Casein.
Separator (raw cream)	8	0	85.3	12.6	0.6
Ditto (scalded ")	7	13¾	86.4	11.9	0.5
Tub-and-hand	7	10¼	79.8	16.7	1.1
Scalded cream churned	6	15	84.1	13.8	0.5
Shallow pan (raw)	6	7	84.8	12.5	0.5

It will be seen that the greatest quantity of butter from 200 lb. of milk was made from separated raw cream, and the next greatest quantity by separated cream scalded. This was due to the fact that by the use of the separator the percentage of fat left in the skim milk averaged only 0.11 per cent., against 0.48 or more under the scalding system, and 0.94 by the shallow-pan method. But the butter from separated cream was not only greater in quantity; it was also richer in fat, and much more free from water and casein than the tub-and-hand butter. The latter, it will be noticed, contained no less than 16.7 per cent. of water as the average of six lots, and 1.1 per cent of water as the average of six lots, and 1.1 per cent. of casein than the butter made from scalded separator cream. In quantity of butter the tub-and-hand process came out third, beating the churned Devonshire cream by 11¼ oz. But, as the analysts point out, 7oz. of this difference represented excess of water, curd, and salt. The shallow-pan butter came out lowest of all in quantity of product.

The butter was examined by the analysts as it was made, again at the end of a week, and once more at the end of a fortnight. Portions of it were also sent to three judges—Mr. Thos. Cundy, of Devonport; Mr. George Jackson, of Birmingham; and Messrs. Loram Brothers, of Exeter. How the prizes were awarded is not clear, as the judges were never together. ALL SIX PRIZES WERE AWARDED TO THE TUB-AND-HAND BUTTER, which is not surprising, as two out of three of the judges who acted (Mr. Julial Webb had samples sent to him, but did not send in any report) were Devon men, while three out of the four members of the Sub Committee were also residents in the county. Devon people like the flavor of butter made in the Devon fashion, and, therefore, however impartial they desire to be, they would be likely to consider such butter the best. The analysts agreed perfectly in their judgments, though they formed them separately. They considered that all the scalded-cream butter kept better than the butter made from raw cream; but they preferred the churned scalded cream butter to the product of tub-and-hand, and the scalded separated-cream butter to either the product of raw separated cream or that of the tub-and hand process. It is curious to notice that Mr. Cundy describes the three samples of scalded separator-cream butter at the end of fourteen days as "very strong," "strong," and "strong"; while the Burmingham judge says of the first that it had kept well, and was only just turning, and of the second and third that they also had kept well, their flavor being "quite sweet." The third judge found the sample which Mr. Cundy pronounced "very strong," "very good" and "still in perfect condition," while the second he deemed "off taste," and the third "medium."

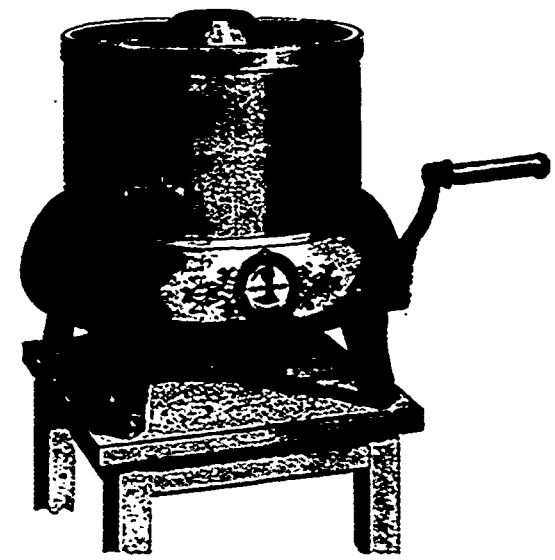
The Sub-Committee, in their report allude to the large percentage of fat left in the skim-milk from the tub-and-hand process, and point out that, on its being poured through the separator, the skim-milk from 400 lb. of whole milk yielded enough cream to make 1 lb. of butter on the first day, 10¼ oz. on the second, and 7½ oz. on the third. But they express the opinion that "the value of the butter thus recovered is not equivalent to the difference in value between scald-cream milk and the separated milk where there is a demand for the former." In allusion to the large quantity of water and the considerable percentage of casein found in the tub-and-hand butter, they refer to the reports of the judge as indicating that these faults do not interfere with the commercial value of the butter. Therefore, while they admit that, as an instrument for extracting the utmost possible amount of fat from the milk, the separator is unequalled, and very profitable used in dealing with any quantity of milk exceeding the produce of, say, eight cows (though they think that the cream should be scalded), they contend that, for small dairies, the tub-and-hand process is probably the most economical in the whole, owing to the greater value of the skim milk, the saving of expense for apparatus, and the smaller number of articles to be kept clean. But they point out that Scotch hands may be used in the process instead of the human hand, though they remark that the use of these wooden hands is said to occasion loss of weight in the butter. Probably if consumers knew that they were paying butter price for a considerable quantity of water in Devon butter, its market value would be depreciated. At any rate, it is to be regretted that the use of the hand in butter making should have been encouraged by the award of all six prizes to the butter made by the tub-and-hand process. In spite of the fact that Mr Cundy pronounced one sample "strong" after fourteen days, while he found one of the lots made from scalded cream churned "fair." The other lots of tub-and-hand butter appear to have kept remarkably well.

B.

THE "ALPHA" BUTTER CHURN.

This new pattern churn is entitled to the name "Alpha," since it is produced by the manufacturers of the well-known "Alpha-Laval" separators. The churn, we are informed, is a distinct novelty and a great departure from all the patterns of churns which have hitherto been used. The "Alpha" may be briefly described as a barrel made of hard wood, coupled by cog gear to a handle, by which means it is rotated at a speed of about 150 revolutions per minute; the cream being placed in the barrel is carried round with it, and is thrown against two stationary dashers, which are fixed and do not revolve. A movable lid prevents all splashing, and, at the same time, has a large hole in the centre, through which the process of churning may be watched, and which allows of all gases formed during the process escaping at once. It will thus be seen that the churn is somewhat similar to the "Holstein" pattern, worked on the reverse principle. It is the churn which revolves and the dashers which are stationary. The result of this is that when the butter granules are formed, they, being lighter than the buttermilk, keep near the centre of the churn, and are not brought into contact with the dashers again; this, added to the fact of the churn being open, so that the whole process can be carefully watched, effectually prevents the possibility of over-churning. The churn is made in hand-power sizes, to deal with from 5 to 30 quarts, the prices ranging from £2 16s. to £5 11s. Larger sizes are made for steam power, capable of dealing with up to 105 gallons at one operation. The time occupied in churning is about the same as with an ordinary end-over-end churn. It was originally the design of the manufacturers to construct a churn which would deal with the work in a few minutes, but careful experiments showed that quick churning of the butter frequently results in loss of butter in the butter-milk. The "Alpha" churn is easily turned and washed. It is introduced into this country by the Dairy Supply Company, Limited, of Museum Street, London; Grass-market, Edinburgh; and Mulgrave Road, Cork, who are the sole agents for the "Alpha-Laval" separators.

"Eng. Ag. Gazette."



THE ALPHA BUTTER CHURN.

Apiary.

DEVELOPMENT OF A QUEEN BEE.

When an egg is laid in a cell, it hatches out into a larva or grub in about three days. At first it is so small as to be hardly visible to the naked eye, but it is fed for five days so liberally by the workers that it literally swims in its food.

The food given to the young queen is called royal jelly and has a rather sharp, somewhat aromatic taste. It is the same as that fed to young workers, they being afterward brought down to a coarser diet, while the queen is continued on the best.

While the worker is fed just enough to complete its growth, not an atom being left over, the queen is given so much that she cannot possibly use it all, and when she emerges from the cell there will be found at the bottom of the cell a quantity of partially dried royal jelly half as large as a small pea. The bees are also extravagant in the use of wax in constructing the queen's cell, enough being used for one cell to make a great many worker cells.

During the five days' feeding the young queen lies at first coiled in a half circle at the bottom of the cell, then, having grown too large for that, stretches out at full length in the cell. After a day spent in spinning its cocoon and then two days of rest, a day is occupied in changing into the nymph state, and after remaining in this state for three days the perfect insect emerges from the cell. This makes in all 15 days from the laying of the egg to the emergence from the cell.

"Farmers' Advocate."

THE ONTARIO BEEKEEPERS' ASSOCIATION.

(Specially reported for "Farming.")

The beekeepers of Ontario held their seventeenth annual meeting in Toronto on December 8th and the two following days, during which some good work was done and some excellent papers were read. The meeting was honored with the presence of the Hon. Sydney Fisher, Minister of Agriculture for Canada, who stayed over for a short time on his way to Guelph, in order to address the members. After expressing his sympathy with them, he informed them that any suggestions they might make with regard to advancing the inte-

rests of beekeeping in general would receive his earnest attention. The meeting subsequently acted on his advice, and passed a resolution recommending the appointment of Mr. R. F. Holtermann, Brantford, as apiarist at the Experimental Farm, Ottawa. "Farming" heartily congratulates Mr. Holtermann on the unanimity with which this resolution was passed by the association.

Some of the earliest business before the meeting was the report of the committee on by-laws, which recommended a number of changes in them, rendered necessary by the passage of the new Agriculture and Arts Bill last year, all of which were accepted with one exception. A vote of condolence was also passed to the widow and children of the late Allen Pringle, for many years an active member of the association.

The report of affiliated societies showed that, out of twelve, nine had reported, but the reports were not so full as they should have been. As regards the 1553 colonies which were reported upon, the increase of bees was 55 per cent. In the fall; the amount of comb honey produced, 9,899 lbs; and of extracted honey, 80, 900 lbs.

The treasurer's report showed the receipts to have been $719, and the expenditure $662.83, leaving a balance in hand of $56.17.

Under the head of new business Mr. Newton brought forward the question of freight rates on honey, which is classed so high as to rob the producer of his profit. Several other speakers corroborated him in this, and eventually a committee, consisting of Messrs. Gemmil and Holtermann, was appointed to see if the railway companies would not lower the rates on honey.

The report of the committee on honey legislation, which was presented by Mr. Pettit, was passed, after some changes had been made in it.

THE "PURE HONEY" BILL.

The Experimental Farm at Ottawa was represented by Mr. Fixture, who read a report on experiments on comb foundation which had been held at the Farm. Mr. McFarlane, chief analyst of the Government, from Ottawa, was also present to ascertain the views of the members as to the manner of enforcing the Pure Honey Bill, and as to the standard to be adopted for analysis. A number of the members wanted the specific gravity to be given in the bulletin of the department, but Mr. McFarlane pointed out that what was equivalent, the quantity of water in the samples tested, would be given. Mr. McFarlane also gave some particulars as to the methods pursued by his department in the case of analysis and of prosecutions of offenders against the Act. It seems that a charge of five dollars is made for every sample analyzed; but the Inland Revenue Department will, at their own cost, proceed against persons from whom an adulterated sample has been purchased through an agent of the department. After some discussion, the executive committee was appointed to watch proceedings in prosecutions on behalf of the association.

MR. KINYON'S ADDRESS.

"Beekeeping in Cuba," was the theme of an address by Mr. Irving Kinyon, Camillus, N. Y. The native hive is a long box five or six feet long, and open at both ends. The bees kept are the same varieties as on this continent, and are not at all savage. The climate and country are well adapted for bees, and honey is abundant and very cheap, being worth only about twenty-four cents a gallon. The honey flow begins about the first of October, and is at its best in December. Bees are kept for the wax, which fetches twenty-two cents a pound. Wax moths are very troublesome, and eat both the wax and comb. The honey is of good quality, and is mostly exported to Holland. Foul brood does a great deal of damage.

In answer to a question as to his method of securing comb honey, Mr. Kinyon said that he uses a chaff hive in the spring. When the bees are strong, without danger of their swarming, he puts on an extra super, but no queen excluder, and sees that they have plenty of honey. He hives the swarms on five or six Langstroth empty frames, with starters in the frame below, and dummies on both sides. He uses a quilt instead of a bee space.

HONEY VINEGAR

Some discussion took place on honey vinegar, some samples of which were on view in the hall. Mr. McKnight, Owen Sound, stated that it took fully one and one-half pounds of honey to make an imperial gallon, and gave his method of making. He uses a large barrel, and puts in about two pounds of honey to each gallon of water. The second fermentation produces good vinegar. The process can be hastened by putting in yeast or mother, and by using an old barrel that has contained vinegar. The cheapest medium to use for clarifying the vinegar is skim milk, and it is nearly as good as isinglass or white of eggs, which cost more.

SUMMER AND WINTER MANAGEMENT

Mr. A. E. Hoshal, Beamsville, read a good paper on "Principles of Summer Management," which he illustrated by a number of diagrams showing the proper positions of the honey and brood in various styles of hives. This paper was very favorably commented on by all who heard it, and showed that Mr. Hoshal had studied his subject well. It is impossible in the space at our command to give even a faint idea of the principles he enunciated, as the paper was of considerable length, but we advise every one to secure a copy of the Beekeepers' Report for 1896, and read it there.

Later in the session Mr. Hoshal gave some further information which covered the ground as regards "Winter Management."

FOUL BROOD.

M. F. C. Harrison, B.S.A., Bacteriologist, Ontario, Agricultural College, read is report on experiments with foul brood, which he also gave at the Experimental Union meeting, and which showed the great tenacity of life that the spores of foul brood have, even when subjected to unfavorable conditions. He stated that he was, at the present time, experimenting with formic acid and naphthaline, feeding the former to bees, to see if these agencies counteract foul brood.

A member asked if any of those present had had any experience with white fungus or pickled brood. The reply was in the negative.

A small wax worm attacked section honey in some parts last season. Some of those present thought that it was a new pest, but others held that it was the larva of the bee moth. It is a worm half an inch long. It was suggested that live specimens be sent to Prof. Fletcher at the Central Experimental Farm, Ottawa, who would determine whether they were a new kind or not.

The Flock

SPRING FEEDING OF BREEDING EWES.

(Continued).

If the ewes lamb before the conditions are such that they may be turned out to pasture, they will require liberal feeding, which means about 1 to 1.5 pounds of bran, 2 pounds of hay, and as much succulent food as they will eat. It is very desirable to maintain a heavy flow of milk, and to do this, grain feeding and the free use of succulent food are necessary while the sheep remain in the sheds.

"Pasturage."—It is generally good management to turn the ewes and lambs out to pasture as soon as possible, provided some grain is fed to the ewes while the grass is in a very succulent state. There is not sufficient nourishment in it at this time to properly support the ewes that are suckling lambs.

It is advisable to so stock the pastures with sheep that none of the grass may grow too coarse. On the other hand, overstocking injures the pasture and makes the conditions favorable for diseases. Frequent change from one pasture to another will be found advisable.

"Feeding grain to ewes on pasture."—When the pasture ceases to consist altogether of a fresh growth peculiar to an early spring, there is no advantage in feeding the ewes grain. In our experiments with 40 ewes and 56 lambs it was found that the lambs did not make any greater gain when their dams were fed grain on good pasture. The only compensation for feeding grain to the ewes was in the fact that those receiving grain did not lose as much in flesh as the others. (1) But this greater loss was easily made good again when the ewes were put on rape or pasture after the lambs were weaned.

SUMMER FEEDING OF BREEDING EWES.

In the summer management of the breeding flock there is nothing of more importance than a provision of some green fodder to supplement the dry and parched pastures that are common in most sections in the summer months. For this purpose the crops most commonly utilized are rape, rye, corn, and vetches.

"Rape."—This crop is one that has many advantages for summer feeding breeding ewes. It grows rapidly, produces a large quantity of succulent food, and is greatly relished by sheep. About two months is required for the growth of a crop. It remains fresh in the field for over a month under usual conditions after the first cutting (2) has been made. At the Wisconsin Station 62 ewes, 26 ewe lambs, and 5 rams were fed from 300 to 330 pounds of rape daily throughout the drought of August and September. From August 16 until September 17, 9.75 tons by actual weight were cut from 0.5 acre, or at the rate of 19.5 tons per acre.

In cutting rape at different heights, the best results were obtained from cutting about 4 inches from the ground. Two cuttings were made from the piece so treated, one August 29 and the other November 6, and the yield was at the rate of 36 tons per acre.

"Rye."—The writer has known a rye pasture to be in good condition after being used six years for pasturing sheep. The rye was never allowed to grow beyond the second joint of the stalk. If the sheep did not keep it down, it was cut. It furnished unusually early pasturage for sheep, and was at all times acceptable. Rye grows quickly, will established itself in poor soil, and is eagerly eaten by sheep if it is not allowed to become rank. It may be used as a soiling crop at any time, but with special advantage if sown in the corn at the last cultivation, so as to be ready in the spring before the pastures are in condition to turn the sheep on them.

"Vetches."—These are not as indifferent to climatic conditions as the crops previously mentioned, but where they can be grown they are invaluable for soiling sheep. They are very nutritious, and sheep thoroughly relish them. Mixed with one-third oats, with the object of supplying supports for the vines, they can hardly be surpassed as a soiling crop. In the drier sections, where the need of soiling crops is greater, the vetches can not be made to produce the amount of fodder that rape does.

"Feeding ewes after weaning the lambs."—When the lambs have been taken away from the ewes, (1) the latter should be put on scanty pasture or given the range of a field of grain stubble, to dry up the milk as soon as possible. The ewes, if they have done well by their lambs, will be in poor condition at this time, but it is not advisable to give them full feed.

FALL FEEDING OF BREEDING EWES.

It is a general impression among shepherds that the condition of the ewes at the time of breeding has a marked influence on the succeeding crop of lambs. If the ewes are in vigorous condition and improving in flesh, the prospects are thought to be favorable for the production of a large percentage of lambs. It is equally accepted that the condition of the ewes in the fall prior to going into winter quarters has an effect on the susceptibility of the flock to such diseases as are more or less prevalent during the winter season. It is certain that the ewes may be gotten into vigorous condition much more cheaply and easily in the early fall than at any time later, and it is equally true that a vigorous condition is the best preventive of disease.

"Grain."—As the breeding season approaches (it usually begins in October), the ewes, being in thin condition, require some grain. The best grain for this time is clean sound oats, about 0.5 pound per head daily. If the ewes are brought into a uniformly good condition by grain feeding they will breed uniformly, which of itself is an appreciable advantage. During the past season, out of the flock of 55 breeding ewes at the Wisconsin Station, 52 lambed in the

(1) Always take the ewes from the lambs; the latter being accustomed to the field in which they are, will not fret so much as if they were taken to a strange pasture.—Ed.

(1) And were, therefore, less subject to attacks of disease.—Ed.

(2) Let the sheep do their own cutting. Ed.

month of March, and this was due chiefly to the uniformity in the condition of the ewes, brought about by rape feeding.

"Fall pasturage."—It is advisable to keep some fresh pasturage for late fall feeding. Exercise in the fall is conducive to thrift in winter and healthy lambs in the spring. In our northern climate sheep are housed too much at best. The ewes may obtain more food than would be supposed from a field of fresh pasture that has been in part retained for them.

It is becoming an opinion among shepherds that when ewes are fed on clover aftermath they are more difficult to get with lamb than if fed on other pasture or fed soiling crops (1) In addition there is danger that the sheep may bloat on it. The best plan is to save the second-crop clover for the lambs that have been weaned; and to prevent bloating, pasture them for a part of the day on ordinary pasture, and after they have satisfied their appetites to some extent, change them to the clover.

FEEDING LAMBS INTENDED FOR BREEDING PURPOSES.

When the ewe has lambed, if the lamb after becoming dry is not able to obtain the ewe's milk of its own accord, it should be assisted in doing so. Some of the milk should be drawn from the udder to see that the milk escapes freely, and then the lamb held so that it may reach the teat. If it is too weak to stand, the ewe may be thrown, but it is perhaps better to draw some of the milk from the udder and feed it to the lamb from a spoon. By feeding a teaspoonful every hour for a half day or so, most weak lambs soon become strong enough to get to the teat themselves. It should be seen that there is no dirty wool around the udder or any filth about the teats to prevent the lamb from sucking. In the case of young ewes it is especially necessary that attention be paid to these matters. It is advisable to keep the ewe and her lamb in a pen by themselves for a least three days.

For feeding lambs to be used for breeding purposes preference should be given to bran, oats, and linseed meal (2) These are preferable to corn-meal, which tends to fatten and does not produce growth to the same extent as the other foods. The bran is relish by the lambs, and they may eat large quantities of it without danger or detriment of any kind. Linseed meal is best fed in a mixture with the bran, as it is very rich and concentrated. Oats are seemingly liked by the lambs, but they will not eat them as freely as the other foods mentioned If the oats are ground, the lambs leave a considerable quantity of the chaff untouched. The best results will likely be obtained by giving an equal mixture by weight of bran, oats and linseed meal.

At first the lambs will take only small quantities of grain By feeding them very little at a time, and always taking away what they may leave, they soon begin to eat eagerly and look forward to feeding time To give young lambs all they have capacity for requires frequent feeding in small quantities. When the lambs are yet in the shed and not on pasture our practice in feeding has been about as follows: In the morning about 6 o'clock they are fed a small quantity of grain, in the trough. After the other sheep are fed, if the lambs have eaten their grain, more is put in the trough. At noon they receive another allowance. In the evening they are fed twice in the same manner as in the morning, and they are left at night with some grain in their troughs.

When the lambs are about 8 weeks old, they will eat about 0.17 pound of grain per head daily; when 10 weeks old, about 0.25 pound, and when 12 weeks old, about 0.5 pound.

"Hand-feeding lambs."—In rearing lambs that have lost their mothers, or when the latter do not give enough milk to nourish the lambs properly, it is best to feed cow's milk from a bottle that has a small rubber nipple attached to it. A newly dropped lamb only requires 2 teaspoonfuls at a time given every hour. It has not been found necessary to sweeten the milk with sugar or dilute it with water, but it is strongly recommended to heat the milk and feed it at a temperature of 100o F. The lambs seem to like it hot, and they certainly thrive better upon it. It is necessary to keep the nipple, the bottle, and the vessel in which the milk is heated thoroughly free from any disagreeable taste or odor, such as that of sour milk, else the lambs will refuse the milk. When the lambs are about 2 months old they are able to take in two feeds 2 pints per head daily, in addition to such grain and grass as they may eat.

"Feeding after weaning."—The time for weaning the lambs depends greatly upon the extent to which the lambs are obtaining milk from the ewes. When they are four months old they may usually be weaned with advantage. If they have been fed grain previous to weaning they will not be checked in their growth by it, and they will be almost unconscious of the weaning; but if they have not received grain they will lose in weight and be checked in their growth.

It will be advisable to separate the ewe lambs from the ram and wether lambs. If allowed to run together the ram lambs will annoy the others, and the grains will not be satisfactory. The wether and the ewe lambs may be kept together.

After weaning, the lambs should be gradually made to rely on oats as their grain ration. If on pasture of only ordinary quality half a pound of oats daily may be fed if needed, but if on good aftermath clover or blue-grass pastures less will be required.

When the lambs have just been weaned they should get the best pasture obtainable and, if possible, the field should be some distance from the ewes. There is nothing better for lambs just weaned than second growth clover that has grown up a few inches and has lost some of the freshness characteristic of new growth There is not much danger of lambs of this age bloating on such food. Rape is an excellent food for the ram lambs, and if managed with judgment there is no danger in giving them free range If neither of these can be secured for the lambs, they should at least have a clean piece of blue grass pasture that has not been eaten down by other stock.

The best practice among shepherds giving close attention to the growth of their lambs is to sow rye in the fall for early food in the spring for the ewes and lambs, followed by vetch and oats and by vetch sown alone at intervals of two weeks. These last until the lambs are weaned and the clover aftermath is ready for them. Succeeding this comes the rape crop and fall turnips.

"Feeding during winter."—During the first winter the ewe and ram lambs should received special care. The aim should be to encourage growth as much as possible by good feeding without making them fat. Some grain, preferably oats, and wholesome fodders, such as clover hay, cut corn fodder, and others that they relish, should be fed. Until they become matured the ewe and ram lambs should be fed liberally, for any loss in growth that they may suffer through scrimped or neglected feeding can never be regained in later life.

FEEDING RAMS.

In feeding mature rams it is desirable to maintain them in a thrifty and vigorous condition without fattening. This implies wholesome food and exercise. If rams are made too heavy in flesh at any time, impotency or inability to serve ewes frequently results, and if they are once overfed and made too fat it is a very hard matter to reduce them without serious injury to their vitality. Exercise and not the reduction of their ration is the best remedy for reducing the flesh.

"Winter feeding."—During the winter the object should be to maintain the weight if the ram is mature, and if a shearling or young ram to make continuous improvement. Oats are probably the best grain food, though the addition of some bran is advisable. A mature ram will need from 0.5 pound to 1 pound of grain daily to keep him in proper condition.

The fodders should be chosen so as to give as much variety as possible. They may include clover hay, pea straw, corn fodder, and others, fed at different intervals, or, perhaps better, one in the morning and another in the evening. Some succulent food should also be fed, such as turnips or silage. Experienced shepherds are very decided upon the danger from feeding mangel-wurzels. A great many rams have died from a formation of crystals in the bladder, and these have frequently been traced, it is believed, to the feeding of mangel wurzels. (1)

"Summer feeding"—To secure the best results in the breeding season it is not advisable to let the rams run with the ewes before that time. They should be pastured as much as possible, for in this way they will keep healthier and stronger on their legs. Though the fleeces of the rams that run out may not appear to as good advantage as if housed, yet for results in breeding it is much the better plan to keep them on pasture as much as possible. They should get some grain, the amount depending on their condition.

"Fall feeding."—The feeding of the rams during the breeding season is very important. The grain should be mostly oats, with the addition of some bran and linseed meal. Such fodders as vetches and rape, fed in the shed, are recommended. The breeding season is a severe strain on the vitality of the ram, which has to be met by liberal feeding of grain and other foods in as great variety as possible. About 1 pound of grain daily will be required, with as much green food as the ram will eat. At this time it has been the writer's plan to keep the rams in pens by themselves, and only allow them to go to the ewes each morning. Pasturage is replaced altogether by such green foods as rape and clover cut and brought to the pens.

(1) We mentioned this, some years ago, as having occured to our old farm-too. Wm Ridgen's show rams in 1832.—Ed.

(1) An error.—Ed.

(2) And pease.—Ed.

THE HAMPSHIRE, A GENERAL PURPOSE SHEEP.

J. H. TAFT, MICH

By a thorough system of breeding and ordinary methods of management, the Hampshire Down has been brought to his present state of perfection. He now illustrates what skillful breeders can accomplish in preserving vigor of constitution and general hardihood, and, in addition, the desirable qualities of early maturity, disposition to lay on flesh, with the fat and lean properly intermingled, and symmetry of form, with a most useful and valuable fleece of wool.

His head is rather long with a Roman face, neck medium length and usually well set on shoulders sloping, brisket deep, with abundant room for the vital organs, back straight with a good spring of rib going around the barrel, loin broad, quarters long and broad, hams round and heavy, legs bony and strong, feet large and open with a tough sole and crest. The face and legs are the blackest of any of the Down breeds. The wool is of medium length and strong fiber; it is used for making cheviots, tweeds and such business cloths and commands the top prices. Flocks of breeding ewes average seven to eight pounds of combing wool.

The rearing of the Hampshire has always been under such natural conditions of exposure and food that their constitutions are remarkably "sound and strong" and in no sense delicate. Consequently they are singularly free from disease and maintain their health and vigor as do few other animals, in heat or cold, in drouth or storms, in short feed or in plenty, and whether closely confined or allowed the freest range. Associated with this constitutional vigor is prolificacy. My breeding flock often averages 175 per cent of lambs and never less than 150 per cent. (1) As a result of this vigor, the young are remarkably strong at birth and are quickly upon their feet and ready for business. The ewes are excellent mothers and immense milkers, having udders like small cows. In all my experience I never had a Hampshire ewe refuse to own her lambs.

The rapid growth, early development and excellent fattening qualities of Hampshire lambs are due to the fact that with their constitutional vigor they are able to eat, digest and assimilate a large amount of food. No such results can be accomplished with any animal without liberal feeding. With such feeding, a Hampshire lamb is worth more for the butcher at a given age than is a lamb of any other breed. The quality which gives to the Hampshire his greatest practical value and the one which above all others commends him to the average American sheep raiser, is his extraordinary prepotency—that power which enables him to stamp his characteristics with unerring certainty upon his off-spring. This is especially important where the blood is crossed with common ewes, either for the sale of the first cross, or for grading up a flock so as to make them as good as pure-bred for all but breeding purposes. The first crosse so strongly resembles the Hampshire that in many cases it takes a good judge to distinguish them.

(1) We once had 9 ewes lamb, in one night, 19 lambs! In Hampshire Gtooths.—Ed.

The various leading mutton breeds of sheep have now been tried long enough in America to have demonstrated pretty clearly their relative value under our conditions. I believe that it has been clearly shown that the Hampshires are inferior to none, whether they are kept as pure bloods or are used as crosses. Each of the Down breeds has its peculiar excellencies. The Southdowns have their compactness and beauty of form and quality of flesh; the Shropshires have their symmetry and good fattening qualities; and the Oxfords, with abundance of food and the best of care, are truly magnificent in their proportions and their weight; but for the combination of hardiness of constitution, freedom from disease, ability to withstand grief, whether of exposure or shortness of food, general "useful" qualities, excellence of flesh, value of fleece, strength and vigor of limbs and their quick development and fitness for market, motherly quality of the ewes, docility and prepotency when crossed upon other breeds or upon common stock, it may well be doubted whether a superior to the Hampshires can be found.

"New-Eng. Homestead."

LAMBING TIME.

There can hardly be any man in Canada that knows more about fine sheep than Richard Gibson, of Delaware, Ont. What he has to say about lambing is worth noticing:—

"It is seldom that a lambing season passes without some cases of false presentation appearing. I am not going to give any instructions in these often difficult cases, but merely a caution to be particularly careful to well wash the hand and arm in warm water, to which carbolic acid has been added, before attempting relief, also wash the vagina with the same. By the aid of antiseptics surgeons are enabled to perform operations that a few years ago would not be attempted, for fatal results would most certainly follow. The surgeon's experience may well be laid under contribution in the lambing-pen. Be particularly careful in removing the placenta, and keeping the pen scrupulously clean and sweet. The afterbirth quickly becomes putrid, and a ewe during the process of giving birth wanders around trying, without avail, to find a comfortable spot, and strange if she should miss lying where these decaying evidences of a shepherd's carelessness are. If so, the results would probably be a case of inflammation of the womb, or blood poisoning and death. If assistance has to be given, great care must be used, only helping during the throes, and gently manipulating the vaginal walls while an assistant draws upon the lamb. In cases of straining after lambing use a strong dressing of carbonic acid and olive oil, one part to seven, well mixed. A wineglass may be injected into the uterus twice a day and the old remedy administered internally of two to four drahms of laudanum to same amount of spirit nitrous ether. When the straining ceases, nothing removes the fever and tones up the system better than quinine."

There is always risk of blood poisoning from handling decaying tissues both to the sheep and the shepherd. Beware of scratched hands! It is often necessary for the shepherd to give assistance to the ewe during lambing, sometimes to remove the dead lamb's tissues. If there be any cuts or scratches on the hands, there is some danger of blood poisoning in case the foetal tissues are decaying. Be careful about that; disinfect the hand very thoroughly with some good carbolic sheep-dip, like milk-oil or zenoleum, or, if these are not at hand, use common turpentine or kerosene oil. Be careful that there are no boards lying around with rusty nails in them. They may cause death by lock-jaw to sheep, horses or men. In case you step on one, disinfect wound thoroughly, for lock-jaw is a germ disease. It is well to wear a shoe with the sole wet with some good disinfectant, Kerosene, if nothing else is handy. Lock-jaw is a particularly unpleasant form of death, and nearly incurable after once it has hold.

Note.—A filthy pen is a sure and frequent source of puerperal fever in the ewe, and the only cure is to put up new sheilding in a temporary way and clear out from the old, burning the whole affair if of little value otherwise.

"Nor'-W. Farm."

The Poultry-Yard.

DUCK-RAISING AT WHOLESALE.

II.

(The Operations of the Weber Brothers, in Norfolk County, Mass., near Boston.)

(Continued.)

During the height of the season they feed 14 tons of grain per week. The requirements of 500 breeding ducks are five bushels of grain and one barrel of turnips per day, beside green food.

They have not adopted the system of tramcars run on wooden rails for distributing this food, owing to their houses being so far apart. They use wheelbarrows for the transportation of the pails of feed to the various pens. Cheap 10-cent wooden pails are preferred for this purpose, as they are light and a man can handle two with each hand, or four at one time. When watering is done beyond the limits of the water supply system, milk cans are used, as they are much more conveniently handled than pails.

They do not cook the feed, but mix it with the hot cooked vegetables, so it is thoroughly warmed. They use a 60-gallon and a 30-gallon set kettle for boiling vegetables and heating water. The feeding is done throughout the season by two men with the assistance of two boys. In all 14 persons are employed on the place from May until September.

The farming now done is mostly the raising of vegetables and green crops for the ducks. The quantity of manure produced is much greater than when 18 cows were kept, and the land, once quite poor, now grows great crops. Where ducks are yarded, the manure must be scraped off and removed, and rye or some other crop grown each season to purify the land. They raise 500 bushels turnips, the variety preferred being the yellow Swedish turnip, and 100 bushels carrots, as well as the rye and corn fodder. They use 200 head of cabbage during the season. Two hundred White Wyandotte fowls, the breed they like best, divided into flocks of fifty, are kept in a house 140 feet long and 16 feet wide, but they intend to devote their whole energies to ducks.

To lengthen their season and keep their professional pickers employed longer, they sometimes buy live western ducks and fatten them for the market. Last fall they handled 3800, and the season before 3000 western ducks, in addition to what they raised.

As it is the early ducks that pay most they aim to secure fertile eggs, having strong germs, early in the winter, and do excel in this respect.

The old ducks do not usually lay much before February; so young ducks are depended upon for early market production, the mature old birds being used in the production of breeding stock. While they are able to induce their young ducks to lay as early as they wish, they cannot persuade the drakes to fulfill their part of the programme much before New-Year; therefore young ducks are not encouraged to lay much before that time. They prefer for breeders, ducks that weigh eight pounds and drakes that weigh twelve pounds when mature. A thirteen-pound drake is too heavy. They are selected in July from the April-hatched birds and only from those that were raised from mature stock, yearlings or two year-olds. They are chosen for depth of keel, size, weight and plumpness. They are then put in large yards, where they have access to grass pasturage and have much freedom and are fed more growing food than is given those that are to be fatted for market. This consists of equal parts of shorts, gluten feed and ground oats, to which is added five per cent. of beef scraps, and it is given them twice daily. At this time they are also mated just as they are to be bred the following season. Beginners usually mate ducks too late in the season; it should always be done by Nov. 1, to insure best results.

During the summer and early fall these birds are not housed at night but allowed access to a house that is openly built of boards and is without windows, which gives them shade or shelter. About Nov. 15, they are placed in the houses for laying ducks and allowed the liberty of a yard 100 by 20 feet during the day. They are then fed twice daily on a mixture of equal parts shorts and ground oats, to which is added five per cent beef scraps.

About Christmas, when grass and green rye are no longer available, corn meal is substituted for the ground oats and ten per cent of beef scraps given instead of five per cent. To the mixture is also added one-fifth part of boiled vegetables—beets, turnips, or carrots cut up in a root cutter and cooked in a boiler. They are also fed cut raw cabbage and raw turnips, two or three times per week. The raw cabbage is cut in a root cutter and the turnips in a bone cutter. The cabbage fed is never cooked. They estimate that they receive an average of 150 eggs per duck during the season. Most of the eggs laid before January are sold in the market. The clear infertile eggs, tested out on the fifth day of incubation are also sold throughout the season. The production of ducks' eggs to sell in the market they do not consider profitable.

They have no ponds for their ducks, but by the above method of feeding they have no trouble to get eggs that will hatch from Jan. 1 until August. During the season of 1896 fully seventy-five per cent of their ducks eggs were fertile, and of all eggs put in the machines fifty-eight per cent hatched. About Jan. 1, 1896, their ducks were laying about sixty eggs per day. In March they were getting 480 eggs per day from 520 ducks. On Feb. 10, 1897, they received about 400 eggs from 600 laying ducks of which 425 were young ducks, 20 eggs being picked up from a pen of 30 young birds. They also had at this date no ducklings, but had 4,000 fertile eggs in their incubators. On Feb. 23, they had 800 ducklings and 5,200 fertile eggs in machines.

The point is to get the ducklings into market when they bring $1.25 to $2 each. Last season they marketed 1,000 before the price dropped below $1.

Their houses for laying ducks are 85 feet long, 18 feet wide, 6 feet high in the rear, 4 feet high at the front, 12 feet high at the ridge, and cost, covered with neponset, $150 each. They are high and airy and make excellent winter quarters. They are divided up into pens 20 by 15 feet, leaving a three-foot passage-way along the back of the building. In the front there are two ordinary half windows to each pen, and a door for the ducks. There is a window every 20 feet in the back of these building for ventilation. In summer the sashes are taken out and the openings covered with netting. In cleaning out the building the litter is thrown out through the front windows where it can be conveniently removed by team. The floor is well bedded with sawdust and in mid-winter with meadow hay.

During the laying season the ducks are kept shut in the house until 9 o'clock in the morning that they may lay in the house instead of on the ground in the yard. No boxes are furnished for nests; they make their own right in the sawdust.

During the winter one drake is provided for every five ducks, but after June 1st one is sufficient for ten ducks and it is then best to lessen the number of drakes one-half.

Pekin ducks are very nervous timid creatures, and at night will dodge the shadow from a light in great terror. If startled in the dark by one jostling against another, they become so frightened that the whole lot may rush about in excitement and terror until morning. Unless this is prevented, they run off much flesh in a very short time and otherwise injure themselves. To prevent loss in this way, the Webers light the houses and yards at night. Every house and yard where ducks that have feathered out are kept is provided with a large street lantern such as are frequently used for lighting country towns. Young ducks while in the brooders do not need to have their quarters illuminated at night.

The illustration of interior of incubator house (see page 370) looks down the aisle between the machines, the lamps of which are removed. During the height of the incubating season the Webers fill a six hundred (hen) egg incubator every other day and therefore have a machine hatching ducklings every two days. An incubator that holds 600 hens' eggs, or is supposed to, will take 500 ducks' eggs, if they are heaped up in the trays. By the time they are tested, the fifth day, and the infertile eggs removed, there will be no more than the trays will properly hold.

A fair average hatch for such a ma-

one is 800 ducklings during the season, but one of the Webers' machines was made to hatch out 1400 the past season ('96). The largest percentage from one incubator full of ducks' eggs (350) was 375 ducklings. As previously stated, they hatched 48 per cent of all eggs put into the incubators in '96. The largest percentage from one incubator full of ducks' eggs was a trifle more than 50. They have 18 incubators 100 egg size in two incubator buildings, and have no trouble to regulate them and rarely have an accident. They think that a 300 egg machine is the most desirable size to operate and that a small incubator cellar is better than a large one. One of the brothers has entire charge of this department and leaves it to take care of itself from 11 p. m., to 5 a. m. Another brother has entire charge of the brooder houses.

The incubators are started at 102o, but when they are hatching the temperature runs from 103o to 106o. Mr. Weber has had it go up to 112o at this time without harm, but advises no one to try it. From 105o to 106o is the temperature he aims to keep when they are hatching. In his locality it is best to fill one of the water pans beneath the trays on the 7th day and another at the end of the third week, to give moisture, and the pans should be kept well covered, and water added as fast as it evaporates. As the machines gain about three degrees in temperature every day after the second week, they must then be regulated daily. He does not ventilate the machines until the eggs are pipped, unless the temperature has run up too high and it is necessary to cool them quickly. In the summer it is frequently necessary to turn out the lamp in order to prevent the temperature from going too high. Their last hatch comes off about Sept 1.

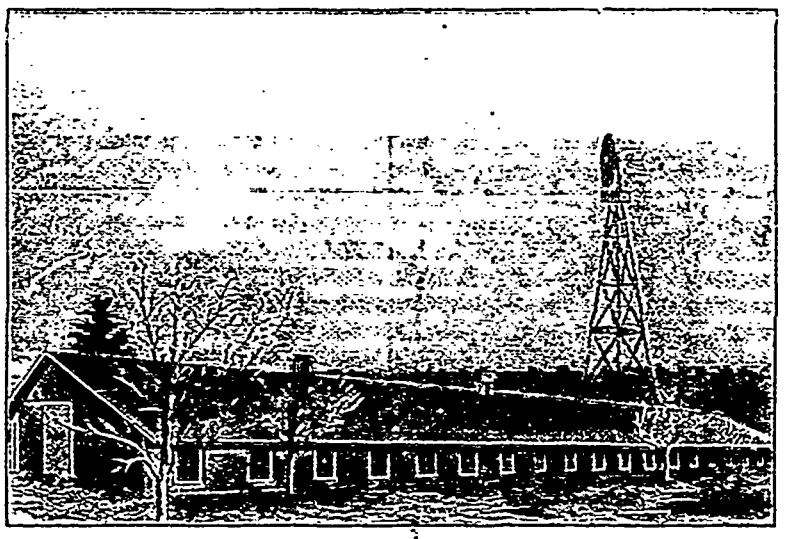
Usually it takes about two days for all the ducklings to hatch. Twice each day, those that have dried off are put beneath the trays, where they are left for 24 hours, and then transferred to the brooder-house, where they are at once watered and fed with rolled oats and bread crumbs. Each downy duckling is counted as they are taken from the box in which they are brought from the incubators, their bills dipped in a pail of water, and then dropped upon the feed board covered with bread crumbs. When their beak touches the board, some of the dry food adheres to it, is tasted and immediately they search for more. As soon as they have eaten, they are put under the hovers, which are at first kept at 100o and then gradually reduced in about four days to 80o. The Webers buy stale bakers' bread by the ton. They have no bowel trouble among their ducklings, because they are so strong and vigorous. It is only those that have weak vitality that die. These little ducklings are fed the above five times daily for about a week. The very early ducks are fed on rolled oats and sweet milk until they are two weeks old and sometimes longer.

The two brooder-houses are each 130 feet long, and the best one is 16 feet wide, 4 feet high in front, and 6 feet high at back—see illustration of exterior of best house, photo taken after the season was over, when the wire netting division fences had been removed and the yards planted to purify the ground. The brooder-houses are heated with a hot-water system, a Crawford No. 25 heater, at one end heating the water which circulates through 2 in. pipes, that run under the cover of the hover. These pipes are 6 inches from the ground and can be filled in, and brought up to any desired height. In this case the pitch of the pipes is 3 feet, in 130 feet, much greater than is customary, owing to the house being built on sloping ground. The circulation is therefore very good.

The house is divided into pens, 4 feet wide and 9 feet long, with a 2½ foot passage-way in the rear, running the length of the building. The hovers are 4 feet wide and 30 inches from front to back, and instead of the front being covered with a curtain, the opening is inclosed part way at the ends and a space 26 inches wide left entirely open in the center.

These houses are without floors and the ground in the pens is deeply covered with sand. The low partitions between the pens, which are removable, are made of 12-in. boards which are held in place by cleats.

A small water pipe, under which is placed a fountain, extends from above into each pen and the attendant as he passes along can, by reaching out and turning on and off two cocks at a time, very quickly fill all the fountains with water. These pipes, the fountains being removed to the passage-way, may be



THE WEBERS' BEST BROODER HOUSE

distinguished in the illustration.

Great care is taken to wash the fountains thoroughly every morning. After the ducks are two weeks old, they will not go under the warm hovers—sixty degrees, the winter temperature of the house, being warm enough for them. If the out-door temperature is favorable, they are put out of doors when four weeks old where they are given a shelter from the sun and storm. It is very important that young ducks have access to shade; if exposed to the direct rays of the sun in warm weather, they do not thrive and many will die. If put out before May, they are driven in if a storm of sleet or unusually severe weather occurs.

The Webers prefer shingled houses to those covered with tar paper or neponset. One tar-papered house was repapered twice in eight years and retarred fourteen times during that period. Ordinary coal tar cracks too often to be satisfactory. A shingled house costs more but lasts longer and requires less attention.

At three weeks of age a more growing food is given the young ducks. This is composed of equal parts shorts, gluten feed and ground oats, to which is added five per cent beef scraps. Enough "red dog" flour or fine middlings is added to make it stick together. This is fed four times daily. The food is fed in troughs. Wooden troughs eight inches deep, nine or ten broad and five by fourteen feet long also make the best receptacles for water. Green food is also given them once per day. At eight weeks of age their food consists of four-fifths corn meal and one-fifth low grade flour and ten per cent beef scraps, and is given three times daily. They receive onesper day all the clover or fodder corn cut up fine that they can eat. The ducklings are fed green food from start to finish. The Webers find waste lettuce leaves most excellent for little ducklings and they buy them by the wagon load when they can get them, and think of putting up a hot-house in which they may raise lettuce sown broadcast. They buy daily many cans of skimmed milk at 6 and 7 cents per can of 8½ quarts and mix it with the food for fattening ducks. As soon as the young ducks reach a weight of 5 lb., which they do at about ten weeks, they are killed and marketed.

Men are employed who make a business of killing and plucking ducks, and it is their intention to keep four pickers employed from spring until Christmas. Last season they hired three pickers six months and two additional men for three months. Their best pickers will dress 40 or 50 Pekin ducks in a day of 12 hours. The pickers receive 7 cents for each duck dressed. They are killed by making a cross cut with a dagger or narrow butcher knife in the inside and back of the mouth to cut the arteries of the throat, after which they are stunned by a sharp blow on the head from a club. They are always dry picked. If the feathers were removed by scalding, the price received for the ducks would be very low. The picker sits alongside a box, into which the feathers are thrust and which is about level with his knees. He lays the duck across his lap and holds its head between his knee and the box to prevent its fluttering and the blood from soiling the feathers. While removing the feathers he frequently wets his hand in a pail of water suspended within easy reach, which causes the feathers to stick to his hand and enables him to remove them very rapidly with little exertion.

In removing the pin feathers, they are caught between the thumb and the blade of a knife held in the hand. Before this is done the pin feathers are thoroughly wet that they may stick to the thumb and be more readily drawn. The feathers are left on the head, neck and wings of the ducks. Care is taken thoroughly to wash the legs and to remove the blood from the head and mouth. A string is also tied around the body to hold the wings in place. The dressed ducks are then soaked in fresh water until evening when the water is changed and ice added to it. Birds killed Saturday are kept in ice-water Sunday and shipped on Monday. The ice-water takes out the animal heat and shrinks and hardens the skin and gives them a better shape. They look less flabby. Those killed in the morning are iced and are ready for shipment at night. They are packed for shipment in barrels with coarsely broken ice and the barrels headed up with a piece of burlap or bagging.

When picking, the hard feathers are thrown out and the others put in a bag and placed in the feather loft to dry, after which they are sorted and repacked in large bags for shipment.

They formerly received 50c. per pound for their duck feathers, but lately they have brought but 35c. They sell them to wholesale *feather dealers* in Boston and New-York. They sold one ton of feathers last season. The price received does not quite pay the cost of picking the ducks.

If one should ask the Weber Bros what are the worst snags to be avoided in following this business, they would probably say: Do not breed "in and in" or raise breeding stock from anything younger than yearlings. Do not fail to give your young birds, *to be used for* breeders, more growing food and more freedom than you give the ducks that are fatted and killed. Mate up before Nov. 1, and be sure to feed plenty of cooked vegetables and green food as well as the right grain, if you want the eggs to be fertilized early in the winter.

Their unusual success in securing a high per cent of fertile eggs early in the season *should cause the beginner* in artificial duck culture, at least, to heed this advice in every particular.

SAMUEL CUSHMAN.

THE NEW FARM.

Finding he needed more room for his fowls as well as more water for his ducks than his suburban place afforded, Mr. Pollard secured, about a year ago, a 60-acre farm a few miles out in the country that is almost an ideal place for duck raising on an extensive scale. This place is made up of hills and hollows, ridges and marshes, and has a stream running through its whole length which furnishes all the water needed for duck ponds. The soil is a gravelly loam over a gravel subsoil. Natural marshes between gravelly hills and steep slopes leading down to the water give every natural advantage desired in laying out yards for breeding ducks. The marshes and ponds are as near like the natural home of the duck as can be had. It would seem that several generations of ducks bred with such liberty and surroundings must regain all the hardiness and vigor of their natural state, and that a high per cent of fertile eggs would be insured.

The duck house on this place, put up last year, is 120 feet long, 12 feet wide, 8 feet high in front and 4½ feet high at the back. It is built as cheaply as possible, of one thickness of ordinary boards and covered with Neponset paper. The inside is divided up into pens, two of which are 12 x 20 feet and five 12 x 16 feet; 27 ducks and 5 drakes are kept in each small pen. The partitions are only three feet high, being made of 12-inch boards nailed across at both the top and bottom with the

space between covered with netting one foot wide. The top board is quite desirable, as it prevents the netting from being bent down, and the ducks are less liable to run against the partition or try to jump over. In the front of each pen is a window about three feet square, high enough from the ground so that it will not be broken by the ducks, while in the rear at a convenient height, is an oblong trap-door through which the manure is shoveled out as well as the planer shavings thrown in right from a wagon. Speaking of the Neponset which covered this building, Mr. Pollard said that he liked it, and that it looked the best, but he could buy three-ply felting at the same price, and a barrel of tar enough to cover the whole building, for one-third what it would cost to buy the paint for the Neponset. In the yards adjoining this house and on the ponds connected with them, were flocks of fine Pekin ducks actively feeding or sporting in the water. Four hundred ducks intented for breeding were in sight, over 200 were yearlings or ducks of a previous season, and the rest selected young ducks. At least 300 of these were carried over winter and are being bred from.

Scattered about another and a higher part of the farm were, at least, 800 white chickens. About 600 of them were White Wyandottes *and the remainder* were White P. Rocks. These chickens, previously mentioned, were reared artificially and brought out here when well feathered, and sheltered at night in wired-in sheds scattered about the place. Twenty-five of these sheds were of the well-known Hodgson make (the retail price of which is $5), and had given satisfaction. In very windy weather, they may be overturned in the day time unless staked to the ground. At night, however, the half-grown chickens on the roosts generally weighted them down sufficiently to prevent their overturning. On this farm, Mr. Pollard will soon build a pipe brooder house 115 feet long fitted with the same brooding and internal arrangements that have given such good results in the home brooder described, also another house of the same pattern for a cold brooder, to receive the chickens or ducks as soon as they can get along without artificial heat. A system of water pipes with a steam engine to fill the supply tank once a week, as well as an incubator cellar will also be built immediately. There will be a drive about the place from building to building for the convenience of the team to be used in making the rounds when the feeding and other work is done. A flock of Embden geese will also be used for breeding, the nucleus of which has already been secured. The stone walls on the place, which are regular vermin harbors, will be used in making foundations for buildings.

PREFERS WHITE WYANDOTTE FOWLS.

As Mr. Pollard has been a buyer of live poultry for years, he is familiar with the various markets and has learned what stock sells best when dressed. He has found that purebred stock, especially if directly from the yards of the fancier, has usually been in poor condition and unsuited to his purpose, but that farmraised poultry having free range, whether they were purebred, cross-bred, or scrub stock, usually could be depended upon to suit his customers. He found that certain breeds that he bought, no matter how favorable the circumstances under which they were reared, were, when dressed, so narrow-bodied, blue-meated and white-skinned, so very unattractive in appearance, that they could not be sold and had to be used for home consumption or given away. Other varieties had such well-proportioned carcasses, such full breasts and yellow skin and legs that, even when rather thin, they were so attractive that they sold quickly at the highest price when dealers would refuse stock not so good at any price. This fact naturally caused Mr. Pollard to favor certain breeds and to discriminate against others. When buying stock for the market, he did not care what the breed was if the stock was good enough to suit his trade, but he did not fail to notice which blood had the best influence and gave the most value to a flock. Therefore, when he leased his first farm and commenced to raise poultry in considerable numbers, he decided that if it paid to buy and sell the best, it was still more important that he should produce the best. He, therefore, secured a flock of Light Brahmas and Silver Wyandottes, although he has since discarded them and now keeps White P. Rocks. He considers the former the best all-round fowl and much more profitable. The latter are kept because there is a demand for them, and they sell well for *breeding purposes. Although a* very promising fowl, the latter must be very much improved before they will equal White Wyandottes. White Wyandottes, in his experience, produce better eggs, as regards size and color, than White P. Rocks. The latter will eat twice as much and lay no more eggs. Their eggs, although not as handsome as those from Brahmas or Langshans, are nearly so, not five per cent of the eggs laid being light-colored. Only dark eggs are selected for hatching. Although they will not lay as many eggs as White Leghorns, Mr. Pollard claims that they will lay as many dollars' worth in the year and sell better in eastern markets, and when the fowls or chickens of each are dressed for the market, the difference in their value is great.

His breeding Wyandottes are kept in small houses about the outskirts of the farm away from the rest of the stock, and are given free range to insure vigor. It should be remembered that Mr. Pollard knew his market before he commenced operations. His brother is, also, head man at the stall of one of the leading poultry dealers at Faneuil Hall Market, Boston, and he is himself in a position to keep posted. After raising his stock, he knows when to sell it and how to get all the money that can be got for it. This end of the business is usually the last to be studied by the enthusiastic person who thinks of rushing into the business, but if he is wise, he will make it the first.

Rhode Island.

SAMUEL CUSHMAN.

"Rural New-Yorker."

WARM HOUSES.

A warm house for laying stock is an absolute necessity. We do not mean one artificially heated, although some breeders of the large comb varieties are obliged to use artificial heat to protect the combs from freezing.

There are a great variety of houses used by the best breeders and hardly any two are alike. Yet they are all constructed with the same idea, to withstand cold winter weather. It is a somewhat difficult matter to construct a wooden building so that it can be kept frost proof. Frame dwellings, be it remembered, are kept warm by artificial heat and would not be habitable without it. A hen house should be so constructed that water will not freeze in it during the coldest weather. If such a temperature can be maintained, there is no doubt that plenty of eggs all winter will be the result. A warm house is more important than feed, in fact all the feed in the world will not induce hens to lay if the house is cold.

The first thing to consider is location. Select a site which is well protected, especially on the north and west sides. *If fortunate enough to find a side hill,* then the conditions are most favorable, otherwise barns or other buildings can be utilized for protection. A grove of trees will often answer as a strong wind-break. As the sun rises later in winter and further towards the south, houses should face generally south, with a slight inclination to southeast.

Next, they should be built low, as low as possible. Some of the best are sunk two or three feet in the ground, thus exposing as little surface above ground as possible. A high-built house is always cold and drafty.

In the construction, the dead-air space is recognized as the most important consideration. This can be obtained by using 2 by 4 scantling on all four sides. On the outside nail sheathing boards, then builders' paper (the double quality is best) on these, and then novelty siding or clapboards. For the interior of the house, lath and plaster is the cheapest and best finish. This gives a dead-air space of four inches, which will be found quite sufficient.

The roof is more important than the sides. Many houses, well built otherwise, have proved themselves useless because of badly constructed roofs. All roofs should be lathed and plastered, or ceiled over inside, thus maintaining the principle of dead-air space. Shingles we consider cold and leaky; besides, the pitch necessary to insure against leaks compels one to build too high, and thus create an overhead draft, which is most injurious to the stock. Patent paper or other compositions are the best materials for roofs at the present time, but it must be remembered that the finishing inside is all important. Whether an earth or board floor is the warmer, is a question. We are inclined to natural earth, although boards may be drier.

The windows should not be large—too much glass is a mistake. After years of experiments, we consider that windows are more important as means of light than for attracting so much sun heat. Fowls require light and cheerful quarters. They keep in better health thus, and are much happier, which means plenty of eggs.

A house thus constructed will be warm and comfortable; it cannot be made any warmer unless heated. We have said nothing about ventilators because we do not believe in them. Windows opened on clear, sunny days are the best ventilators and about the only kind that will not injure the stock confined. We have never seen any design which we consider safe for ventilating a hen-house, they all having the fault of circulating drafts.

"Country Gentleman."

BRITISH POULTRY.

Under the above heading Mr. Chas. E. Brooke, Past Master of the Poulters Company, contributes a letter to the "Standard," in which he says:—

"That poultry are beginning to appreciate the efforts of the Poulters Company, and the Committee so ably presided over by Sir Walter Gilbey, is shown by the increased success of every Christmas Fat Cattle Show. They recognise more generally than in the past the wisdom of the rule laid down as the result of the experience at home and abroad, that the months of October and November should mark the beginning of the new season. Constituting as they do the transition stage between the old and the young laying stock, greater readiness is consequently evinced in clearing out the old birds which should be got rid of by the end of September. No hens should be kept over two years. Surplus stock in all classes can just now be advantageously disposed of, and should be replaced by young pullets and cockerels.

"The prudent and methodical manager will so arrange his plans that the bulk of his present stock shall be pullets hatched the previous spring. He will retain only a few of the older hens for the following year's breeding. Proper diet will naturally be relied upon as the best means of producing an abundance of eggs, from which strong, healthy chickens may be hatched in the spring. He will have an eye in March and April to the number of chickens required in the year following for laying purposes. He will send the cockerels to market when prices are highest, "i. e.," in May and June. On the other hand, the pullets will be kept in a relatively backward condition as to growth and fatness, lest they should lay too soon, the manager's object being to secure full baskets of eggs throughout the winter months. The older hens retained for hatching and breeding in the spring may be allowed to rest in the interval, like the male with which it is intended to mate them. Breeders will do well to remember that the Baynards capon, or Surrey fowl, always commands the best price in the London market, a position due alike to its size and its magnificent quality. My own favourite cross-breed, as realising the finest characteristics of poultry reared for the table, is that of Indian Game and Dorking—an English bird "par excellence", presenting the best basis for improvement towards all-round excellence. As I have before shown, in the cock bird of the cross between a yellow-legged Indian Game cock and a white-legged Dorking hen, the leg is generally white, and it carries the five toes characteristic of the Dorking, but not of the Indian Game. It is also to be noted that the cross-bred cock has the body and the rich and beautiful plumage of the Indian Game, but a Dorking head and hackles. The plumage is generally of a dark greenish tint, like that of a duck's wing, the tips on either side coming out white. The pullet has a body which is more compact and which is neater than the dark Dorking pullet, which it most closely resembles in other respects; but while its tail is that of the Dorking pullet, its head has a decidedly Gamey appearance. This class of fowl is a hardy breed, and for table purposes cannot be excelled, yielding as it does so much breast, and full, juicy, and delicate flesh.

"The Houdan, to which growing attention appears to be paid, both by fanciers and fatteners, resembles the

Dorking from the fact of its being a large, well proportioned fowl, and from its possession of the artificial fifth toe, and is, perhaps, the most hardy of all French fowls; but, while equal to the Crèvecœur as a layer, its eggs are not so large Plymouth Rock and Old English Game might also be specified as claiming marked attention from our lovers of really good breeds."

THE VILLAGE HENNERY.

Failure to follow some of the plainest conditions of success is the key to most of the discouragement and disgust of many a small poultry raiser. And multiplication of the same errors causes the same, or a worse state of mind and pocket in the larger handler of the work In close quarters, it is insisted that work must take the place of room and range. This is the principle, though perhaps never before formally laid down. Green food, for instance, must be supplied, and that with some approach to the abundance and regularity with which it is available under more nearly natural conditions Fresh, uncontaminated soil must be had for runs, either by upturning or by substitution. Failure to apprehend this need accounts for later failures of those at first successful. As stock increases, quarters are almost invariably crowded. Hardly a raiser but sins more or less in this particular. The simple fact is: Poultry culture on small lots (and elsewhere) is declared a failure because, and often only because there was not sufficient will power to overcome the ever-present hindrances to doing exactly as told. Nearly every poultry raiser can confirm this, since, strange to say, even the successful have usually gone some distance along this wrong road. But they went back to the forks.

EX.

Manures, &c.

AGRICULTURAL EXPERIMENTS IN PLOTS AND POTS.

The following article by Professor R. Warington appears in "Nature" for April 22nd :—

In a recent number of the "Agricultural Gazette of New-South Wales" (Vol. VII. p. 663) there is an article by Mr. N. A. Cobb, written at the request of the Minister for Agriculture, upon the methods employed for experiments with crops and manures. It appears that field experiments are being carried out to a considerable extent by the farmers of the country, but that the results are to a large extent untrustworthy and misleading, owing to innumerable sources of error which the experimenters have failed to perceive and guard against. Science is thus brought into ill repute, doubt is thrown on established truths, and progress hindered. The evidence brought forward goes far to show that this is a true indictment. When, however, the author goes a step further and speaks of field experiments as almost essentially untrustworthy, we cannot agree with him. The sources of error which he mentions may all be avoided by judicious management, if only the experimenter will guard against them at the commencement of his work, and superintend his operations with proper care.

Inequalities of soil are one of the worst evils in field experiments; the investigator frequently remains unconscious of them, the difference in the results being credited to the effect of the manures, &c. It is "very rare" for proper precautions to be taken against this evil, for the simple reason that these precautions imply delay, and the experimenter is generally in a hurry to obtain results. If, for instance, the comparative effect of different manures on barleys is to be ascertained, or the comparative yield of different varieties of seed, the only basis for an accurate trial is to divide the field into the required plots, then sow the whole field with a uniform barley seed, without any manure, and weigh separately the produce of each plot. If the crops obtained are equal, within the unavoidable errors of experiment, the field is one suitable for the purpose of the experiment; if the crops are unequal, the field, or that portion of it in which the inequality occurs, is clearly unsuited for the purpose intended. It is not sufficient, as is often supposed, to inspect the field when under ordinary culture, and because of the apparent evenness of the crop, to pronounce it fit for use; for natural inequalities of soil may not appear in a well-manured field, although plainly manifested when the supply of manure ceases.

The errors due to inequalities of the soil in one series of trials may of course, be neutralised by making many series of trials, and substantial accuracy may be gained by simply regarding the mean results obtained; but if a field is really unequal in fertility, no ordinary arrangement of duplicate plots will suffice to ensure an accurate result. If the same experiment is repeated throughout a wide district, as is often now done in county council experiments, it may be quite misleading to take the mean of all the results as expressing the truth for the whole district. We must not bring into the mean the results obtained in different soils and climates, unless, indeed, our aim is to procure general statistics which are of no value for any particular place. Basic slag and superphosphate will compare quite differently upon a clay and upon a chalky soil, nitrate of soda and sulphate of ammonia will compare differently on dry and wet soils. To take the mean of experiments made under such different conditions is simply to misinform every farmer in the district; yet public money is continually wasted in this way

Mr. Cobb points out that the effect of inequality in the soil may be obviated by substituting rows for square plots. This is true, and the point is well worthy of attention; the suggestion is not, however, novel. In a comparison of basic slag and superphosphate for turnips, conducted by the writer at Rothamsted in 1886, the slag and turnip seed were sown by drill on the top of two ridges down the whole length of the field, and on the return of the drill an equal number of ridges by the side of the first were left unsown. When the sowing of the slag was completed, the same drill sowed superphosphate and turnip seed in all the vacant spaces. There were thus throughout the field two rows of turnips with slag, side by side of two rows of turnips with superphosphate, the repetition occurring many times over. This plan was suggested by Sir John Lawes. This is, for many experiments, a good mode of work, but its use is practically limited to those crops and manures which can be sown by drill; unfortunately, drills are not satisfactory machines for evenly distributing given weights of manure over given areas.

Mr. Cobb next passes to the pot system of experiment; he describes the work at the Darmstadt Experiment Station, with its 1,000 pots, and suggests that work on this system should be commenced in Australia.

There is no doubt that, for solving certain questions, the pot system, when carried out with scrupulous accuracy, is far superior to any other. If we wish to know what is the comparative value to any plant of various nitrogenous manures under the most favorable conditions of supply and use, we arrive at this fact only by pot experiments.

THE USE OF CLOVER AS A FERTILIZER.

By F. T. Shutt, M. A., Chief Chemist, Central Experimental Farm.

NOTE.—The question of using clover as a fertilizer—as a means of restoring to the soil the nitrogen that it has lost through cropping—is a very important one. The theory of the process by which the nitrogen of the air is obtained by the growing clover it not very well understood. What is understood of this process, however, and several other very practical points in regard to the use of clover as a manure, are brought out in the following series of questions and answers, which we are enabled to publish through the courtesy of Professor Shutt, Chief Chemist of the Central Experimental Farm, Ottawa, who has kindly sent them to "Farming" for the benefit of our readers. Of course, in "theory," all the leguminous plants, clover, peas, beans, vetches, etc., may be used as a manure crop, but, in practice, "clover" is the one most generally used.

"Editor Farming.

THE ASSIMILATION OF NITROGEN BY LEGUMES.

"Question 1."—Do the legumes absorb nitrogen by their leaves?

"Answer."—There is no nitrogen assimilated by the leaves of the legumes. All absorption of free nitrogen is by means of the bacteria in the nodules on the roots.

"Question 2."—Do the legumes use nitrogen, other than that in the air?

"Answer."—Legumes, like all other plants, can make use of soil nitrogen (not free nitrogen), and this they specially do when young. Unless the soil is somewhat poor in nitrogen—when it is said to be "nitrogen-hungry"—there appears to be but little assimilation of free nitrogen and but a poor development of nodules.

"Question 3."—How can it be said that the free nitrogen of the atmosphere is utilized by the legumes when it is stated that assimilation is by the roots?

"Answer."—The free nitrogen made use of by the inter-organisms in the nodules is in the air occupying the interstices of the soil. In all soils there is a large quantity of air.

"Question 4."—How do the organisms in the nodules make use of the nitrogen, and what becomes of the nitrogenous compounds formed in the roots?

"Answer."—It is not known how the legumes utilize free nitrogen and convert it into organic compounds. It is, however, evidently a life function.

The nitrogenous compounds elaborated in the nodules migrate (most probably as amides, soluble compounds after-wards converted into albuminoids) into the stems and leaves. This, as a rule, leaves the roots poorer in nitrogen than the foliage. The ratio of the nitrogen in the roots to that in the foliage is a fluctuating one, depending chiefly on the stage of growth or maturity of the plant.

"Question 5."—When is the best time to turn under a crop of clover or other of the legumes?

"Answer."—After the time the seed has begun to form there will not be much more assimilation of free nitrogen. If, therefore, it is wished to enrich the soil with a large quantity of humus capable of ready decomposition in the soil—in addition to the nitrogen—the plowing should be done soon after the flowering of the plant and before the fibre becomes hard and the nitrogen, for the most part, gone into seed.

If sown after cereals as a "catch" crop, it will usually be the best practice to plow it under in the autumn, at the end of the growing season. If sown as a "cover" crop, as in orchards, it should be left till the following spring.

"Question 6."—What loss of nitrogen would ensue on allowing the clover to freeze down and remain uncovered all winter?

"Answer.—There would in all probability be some loss, but unless the winter were an open one it would be very slight.

"Question 7."—Is green manuring with the legumes as profitable as purchasing commercial fertilizers?

"Answer."—Under ordinary circumstances it is the cheapest and most economical means of supplying nitrogen and humus, both essential constituents to soil fertility. Green manuring not only enriches the soil's composition in these elements, but adds largely to the store of "available" mineral food, and greatly improves the tilth of heavy clays and light and sandy soils deficient in humus.

NITRAGIN.

We recently dealt in this column with the subject of special manures, but have not touched upon the newest development in fertilizing agents. Ever since Hellriegel discovered the uses of the excrescences observable upon the root-fibres of leguminous plants, there has been an idea abroad that here was a new key to cultivation, and a new impetus to improvement. The case may be put as follows:—We learn that through the presence of certain organisms existing in fertile soils, excrescences are formed upon the root-fibres of clover, vetches, peas, lupins, and all other podded or leguminous plants. We also know that the luxuriance of such crops is in a great measure dependent upon the presence of these nodules, and that, again, the number of the nodules depends upon the abundance within the soil of the organisms (bacteria) referred to, which, in fact, reside within the excrescences mentioned. We also know that, although in general these organisms closely resemble each other, they are nevertheless specialized to individual species, so that the bacteria which infest red

clover differ from those which infest white clover, as these differ from those which infest peas, lupins, or tares. It is also known that soils in which the proper organisms for a leguminous crop such as lupins do not exist are incapable of producing that crop in abundance; and that this is now the accepted reason why of two equally poor soils one is able to grow a good crop of lupins, while the other is not. The inference is strong and reasonable that if the nitrifying organisms or bacteria, necessary for the development of such a crop could be introduced into the barren soil it would become fertile as regards this particular crop. Such is, in fact, the foundation of the idea of nitragin" as a fertilizing agency. The idea is novel, and in order to understand it thoroughly it is necessary to appreciate the absolute importance of bacteria as a medium for conveying nitrogen to growing leguminous plants. If once this idea is grasped, as well as the fact that bacteria can be introduced and propagated by seeding in a soil, the idea of fertilizing land through the introduction of germs becomes practical. In referring to such a subject it is necessary to presume that the reader has followed in some degree the march of knowledge in this department during the last few years, and the various steps by which the theory of the application of "nitragin" has been developed. To believe that a small bottle of any preparation costing a few pence can be the means of producing fertility over half an acre of land seems at first sight to be impossible, and to rank with amulets and charms, incantations and superstitious rites. Reflextion will, however, show that even a few germs introduced into air, water, or soil spread with amazing rapidity, and become the cause of widespread plagues. Similarly, germinal matter in the form of yeast, rennet, or ferments speedily spread throughout the entire mass, and such appears to be the case with nitrifying bacteria when once introduced into the soil. They spread with amazing rapidity under suitable conditions, and at once attach themselves to the plant for which they are intended, and promote its growth. This is the leading idea of nitragin as now prepared and labelled for use. It is a special cultivation of bacteria for each description of leguminous crop, and is evidently only intended for use upon soils which at present are incapable of growing them. That the idea has passed into a practical fact is evident, because special cultivations are prepared for the purpose, and will be subjected to actual trial this coming season at Woburn, under the superintendence of Dr. Voelcker. The fertilizing effects of leguminous crops have long been known as a fact, but we are apparently only on the threshold of the explanation and application of our knowledge. How far the inability of certain soils to grow clover, and the wonderful fertility of certain poor soils with regard to lupins or even vetches, may be due on the one hand to the absence and on the other to the abundance of nitrifying bacteria is the question now about to be solved. It is difficult to exaggerate the importance of the issue, for it is a suggested means by which the vast store of free nitrogen existing in the atmosphere may be made available for the manufacture of crops. The method is so simple and inexpensive that it appears to be within everyone's reach, and while the Royal Agricultural Society is struggling with this problem, private experimenters might well be preparing evidence on the same subject. In Part II. (1896) of the R.A.S. Journal will be found an account of this novelty, as used in Germany, and the mode of its application. It is extremely simple, for two methods are proposed, either of which can be applied without very special knowledge. The first consists in dressing the seed (as is done in pickling seed wheat), by pouring over it a diluted bottle of the extract, which is really a cultivation of the appropriate germ. The seed is well turned and mixed, and sown with the germs distributed evenly over the whole, and on reaching the soil they fructify and attach themselves to the young root fibres. This seems not only simple, but in agreement with what we know of the tendency of germs when placed under suitable conditions for propagation. The other plan is to mix the extract with soil and distribute the same regularly over the surface, working it in with harrows. Of the two the first seems to be the better, or, at all events, the more easily applied, and direct contact with the seed seems preferable to distribution throughout the whole mass of the surface soil.

What the effect of this discovery upon agriculture will be it is impossible yet to say, but it evidently is no wild fancy, and doubtless has applications in store for it. If by its means the stock of soil nitrogen can be increased without expense, we see at once a discovery of enormous importance, transcending all other known methods. It is entirely natural, and is known to be in active operation wherever leguminous plants grow. If the proper germ is present, as it is in many cases, no particular result would follow the use of nitragin. If, however, a soil is found incapable of growing certain leguminous plants, we seem to have a key to the solution of the difficulty in the introduction of the missing link through which vigorous growth can be obtained.

Popular sketches of great discoveries are liable to be misleading, and it would therefore be well for agriculturists to study the subject in the pages of the Royal Agricultural Society's Journal, and in other sources of information. At present the idea has not been seized upon extensively, and we draw especial notice to it early in the year, for it would be an enormous gain to us if we could dispense with highly nitrogenous manures, and rely upon the agency of bacteria to abstract nitrogen from the inexhaustible stores of the atmosphere. The most remarkable feature of the proposed method is that, inadequate as the means used may appear at first sight, it is when examined seen to be strictly in accordance with known facts.

JOHN WRIGHTSON.

FERTILISERS.

REPORT ON FERTILISERS.—The report of the Chief Analyst of the Dominion on Fertilisers—189-, is just to hand, and from it we gather the following information:

1. There is no possibility of giving a trustworthy account of the total quantity of fertilisers used in Canada, as the manufacturers refuse to supply it; but the value of artificial manures imported into the Dominion, for the year ending June 30th, 1896, is as follows:

Fertilisers, manufactured or compounded	$43.356
Bones, crude	11,082
Bone-dust, bone-black or charred bone, and bone-ash.	23,819
German mineral potash	511
Kainit	1,978
	$80,746

This is exclusive of nitrate of soda—$4,035, and sulphate of ammonia—$6,904; part of which was doubtless used for manufacturing fertilisers. Most of the above,—2,000 tons—were used in the Maritime Provinces, to the ports in which the freight-rates from the States are very low.

2. And now follows an interesting specimen of the peculiarities of the "course of trade:" the exportation of 2,270 tons of bones from Ontario and Manitoba to the U. S., worth about $24,589; besides fertiliser-materials to the value of $36,187 from Ontario and Quebec; the latter item probably representing dried blood and tankage from packing houses or abattoirs, and refuse bone charcoal from sugar-refineries. Still more striking is the fact of the exportation, in the same year, 1896, of 528 tons of our "apatite," or mineral phosphate to Great Britain; besides leached and unleached ashes (potash and phosphoric acid), to the value of $48,883, to the States. As Prof. Macfarlane remarks on this point:

It therefore appears that while manufactured fertilisers are being imported into the Eastern provinces of Canada, a large amount of raw material for making them is exported from the West, and thus a state of affairs is found to exist which cannot be regarded as creditable to our intelligence or enterprise.

The Chief Analyst gives, in a column headed "Relative value per ton of 2,000 lbs." the value of each fertiliser submitted to him for analysis based upon the following prices for the constituents:

	Cents per lb.
Nitrogen in salts of ammonia or nitrates.....	13
Organic nitrogen in ground bone, fish, blood or tankage....	12
Phosphoric acid, soluble in water.	6
Phosphoric acid, soluble in ammonium citrate	5½
Phosphoric acid, insoluble, in ground bone or tankage..... ...	5
Phosphoric acid, insoluble, in Thomas's phosphate powder	3½
Phosphoric acid in ground rock phosphate.....	1½
Potash contained in wood ashes..	6
Potash in high grade potash salts.	5½

In the analysis of the 108 samples received, the insoluble phosphoric acid derived from apatite, our native rock-phosphate, is not reckoned as being "available," which is quite in accordance with the views we have so often expressed in this periodical.

In the columns appended, there is, in several cases, an amazing difference between the contents of phosphoric acid contained in the various fertilisers, according to the manufacturer's statement, and the real contents found by the analyst. These, in four consecutive samples, from a manufacture in the States, stand thus:

Sample 759	Soluble in water
Guaranteed p. c	6 to 8
Found p. c.	1.92
760	
Guaranteed p. c.	6 to 8
Found p. c.	1.60
761	
Guaranteed p. c.	9 to 12
Found p. c.	6.24
762	
Guaranteed p. c.	6 to 8
Found p. c.	1.76

So, if the percentages of phosphoric acid, soluble in water, as guaranteed by the manufacturer, are compared with those found by the analyst in the samples, in these four cases, they will stand thus:

Guaranteed p. c.	6
	6
	9
	6
	27
Found p. c.	1.92
	1.60
	6.24
	1.76
	11.52

By which figures we see that the guaranteed analyses are very much below the mark indeed! And this solubility in water is of very material consequence when the fertiliser is used for the root-crop. For, although the reverted phosphoric acid, as well as the insoluble acid in bones, etc., are very useful in finishing the growth of the roots in the latter summer and autumn, a good dose of water-soluble phosphoric acid is the main point required to push the plant along rapidly, in its early stages of growth, and thus enable it to escape the ravages of the fly.

In the above comparison, we took the lower percentage guaranteed by the maker; now, let us see how a comparison between the highest percentage guaranteed would stand with the analyst's findings:

Guaranteed p. c.	8
	8
	12
	8
	36
Found p. c.	1.92
	1.60
	6.24
	1.76
	11.52

It is clear that there is more than three times as great a percentage in the guaranteed as in the found constituent of the analysis.

Of course we know perfectly well that the larger figures in the guaranteed percentage are only put in to delude the unwary; just as, in the case of nitrogenous constituents, which, in the manufacturers circulars, are always calculated as ammonia; because it looks bigger to say that a fertiliser contains 16.996 p. c. of ammonia, than to say that it contains 14 p. c. of nitrogen; and yet both mean the same thing, since "nitrogen contents multiplied by 1.214, equal the ammonia contents."

The following table may be found useful by some of our readers:

An arpent—36,801½ square feet English.
An acre—43,560 square feet English.
So, an arpent: an acre : : 11 : 13.11.

Nitrogen x 1.214—Ammonia;
" x 6.3—Albuminoids;
Potash (waterless) x 1.85—Sulphate of potash;

Potash x 1.585 Muriate of potash; Phosphoric acid x 1.4 bi phosphate; Phosphoric acid x 1.648—soluble monocalcic tribasic phosphate.

14 p. c., of nitrogen equals, in round numbers—if such things as round numbers are permitted in chemistry, which they are not—17 p. c. of ammonia.

In 1889, organic nitrogen in dry ground fish, meat, blood, etc., was worth 19 cents a pound.

Nitrogen in ammoniates was worth the same price.

And now, as we saw above, Prof. Macfarlane puts the value in the market of nitrogen in ammoniates at only 13 cts a pound, and in fish, meat, blood, etc., at 12 cts.

Moreover, whereas phosphoric acid, soluble in water, is worth 6cts a pound, insolable, it is only worth, in ground rock, 1½ cts a pound; and potash, worth in wood ashes 6 cts, is not worth more than 5½ cts in "high grade potash salts."

MANURES AND FERTILIZERS.

Handling Stable Manure.

S. THOMAS.

In a recent issue, a contributor gives a number of rules for handling stable manure. His first rule is never pile in the field, but scatter from the wagon. If he refers to putting the manure in small heaps to be scattered or spread just before plowing, I agree with him, but if he advises never to compost I do not agree with him. Situated as I am, just on the edge of the city, I have been able to get large quantities of manure. I have tried every conceivable experiment in applying manure, and after years of careful study and observation of the different tests made by myself and others, I have come to the conclusion that to get the best results from stable manure it must be composted either in the field or barnlot. As I haul hundreds of loads of manure from the city, my rules is to make one or more heaps in different fields so that when it comes to spreading I can get it where I want it without having to haul more than 20 rods from the heap. I spread from the wagon and plow under as soon after spreading as possible.

Your contributor says he hauls and spreads his manure while the ground is yet frozen, and the spring rains wash it into the soil. Now if the spring rains come, as they frequently do, before the frost is out of the ground, the part of the manure which is richest in plant food is washed out and carried away. I have seen the dark colored water running down in little rivulets into a stream 20 rods away from where I had spread manure on frozen ground. By properly composting manure the plant food is rendered more available, and one load of the well-composted material is worth almost two in the fresh state. Careful experiments have proved that in the compost heap much of the useless organic matter is reduced, the amount of nitrogen not materially lessened, and the quantity of soluble ash greatly increased. Of course, if in composting, the manure is thrown out of the stable under the eaves of the barn, as it accumulates, and is allowed to lie there without any care or attention until drawn out and spread, probably spreading at once would be best. But if the heap is properly made, the sides built up straight, the top kept level, (1) so it will catch all the rain and snow, and kept tramped down solid so the heap will not get too hot and fire-fanged, forked over once or twice to break it up and fine it down, there can be no question but that composting is the best practice.

"N. Eng. Homestead."

(1) And covered with a few inches of earth.—Ed.

TIME TO APPLY MANURES AND FERTILIZERS.

The excrement of domestic animals never contains any more plant food than immediately after it is voided. Composting it assists in the rotting or fermenting process, and for certain crops and soils may be essential, but recent experience of both practical market gardeners and scientific men is more and more against the old method of composting manure and handling it several times before applying it to the soil. For all ordinary field crops, it is now believed that the sooner the manure is applied the better.

Some farmers have even banished the manure cellar. In place of the manure pile in the cellar, they have a big cart or manure spreader, into which the accumulations of the stable are dumped once a day and then hauled away directly to the field and spread broadcast for corn, potatoes, grass, grain, etc. This is done whatever the season, but, of course, manure is not spread in winter on steep hillsides where it will wash away. On slightly sloping fields, however, even when the ground is frozen, the melting snow contains liquid from the manure pile that will soak down into the soil and the loss from washing away will be very slight. Of course heavy rains or thaws causing miniature freshets on the field, might cause the loss of a good deal of such manure. Each farmer must use his judgment in applying this system. The great advantage of this method is that one handling of the manure does the business. Only those who have changed from the old system to the new style know what a saving in labor it involves. (1) It is used most successfully where no long corn fodder is fed. It is better and cheaper to cut the cornstalks before feeding, than to run the long stalks into the manure pile and handle it two or three times, simply to get the cornstalks rotted.

It is customary to apply fertilizers just before or at time of seeding or planting. For most crops broadcasting is better than in the drill, as the wide-spreading roots will get more of the food. For hoed crops, experience favors a second or even a third (light) application of fertilizers to be sowed between the rows at the first or second cultivating or hoeing. It is often found that the same amount of fertilizer, two-thirds applied before planting and balance during the culture in early part of growing season, gives enough better results over putting the fertilizers on all at once to warrant the work.

A NEW OBJECTION TO MANURE.—This is a topic of which each one who argues on it believes there is little to be said on the other side. (2) The man who finds commercial manures a help is likely to lean over hard on them; while he who has plenty of satisfactory stable manure can see little in their favor. Possibly, from his point of view, he is sound enough. The entomological point of view is seldom taken. Prof. Smith, of the New Jersey station, does not hesitate to affirm that from the entomological standpoint, nothing worse than stable manure could possibly be applied to the land! This is especially the case if such manure be coarse, or mixed with bedding. It furnishes precisely the hiding place and breeding place which most insects desires.

"New Eng. Homestead."

(1) And what a lot of weeds too.—Ed.

(2) Very little except to say that this is another instance of theory run mad. -Ed.

WHAT STATIONS SHOULD DO FOR FARMERS.

WILLIAM WILLIAMS.

In a recent issue, the editor invited suggestions from farmers for work to be undertaken by the experiment stations, and if those to be benefited will avail themselves of the invitation, much good may accrue. It has long seemed to me that the experiment stations are devoting too much time to a few subjects exclusively and that too much work is duplicated, to the darkening of knowledge. For instance, an eastern station informed us some time since that cooking food for hogs was superior to raw food, resulting in an increase of weight. Almost at the same time, I learned that a western experiment station made a statement directly in opposition. Are we to say with the music hall chorus, "There's nothing new, there's nothing true, and there's no use trying to know." Agriculture is not a science, in all its branches, but there are some things that can be ascertained beyond peradventure, and this feeding of raw or cooked food is one of them. Suppose three stations should at the same time, and in a manner agreed upon beforehand, undertake the solution of this matter. It would then be settled, and we should then be able to feed hogs intelligently. For many years I have been strongly impressed with, if not a conviction, at least a suspicion, that the Chinese and Japanese have some good substancial reason for their common practice of steeping seeds in certain mixtures before planting. I base my suspicion upon the fact that these people are not theoretical, but practical farmers, and their economical habits compel them to the closest calculation with a view to profit.

If agriculture is ever to occupy an admittedly respectable standing, it must be in a position to prove that some matters have passed beyond the range of speculation, and are well known, well attested and indisputable facts. At present, I regret to say that there are few subjects connected with it that are not open to question, though perfectly open to solution.

"N. Eng. Homestead."

COST OF NITROGEN IN VARIOUS FORMS.

Nitrate of soda sold in Connecticut last year all the way from $40 to $48 per ton. It contained from 15 to 16½ per cent of nitrogen, the cost of which varied from 12.7 to 15c. per lb. Sulphate of ammonia was sold at $65 to $70 per ton, containing within a fraction of 21 per cent nitrogen that cost 15.5 to 16.8c per lb. Castor pomace at $18 to $20 per ton is an expensive form of organic nitrogen, the element at this price costing 15.5 to 16.8c per lb. Mustard seed cake contains about 5 per cent of nitrogen, phosphoric acid 2 per cent, potash 1 per cent and if sold at $16 or less per ton, it would be as cheap a source of nitrogen as cotton-seed meal or linseed meal.

Connecticut farmers last year bought cotton-seed meal at $20 to $24 per ton, at which price the cost of actual nitrogen ranged from 11.2 to 15.5c per lb, averaging 12.7c. The amount of nitrogen in the standard quality of decorticated meal ranges from 6.8 to 8.2, averaging 7 per cent. At this price, cotton-seed meal is the cheapest source of available nitrogen. Experiments indicate that it is as rapidly and as fully available as in the best forms of animal matter. Linseed meal was bought at $19 to $20 per ton and furnished nitrogen at an average of 13c. per lb, or about 1-3c higher than in cotton-seed meal. The linseed meal contains a fraction less nitrogen than does cotton-seed meal.

"New-Eng. Homestead"

Science.

BORAX.

A friend has forwarded to us a copy of a 16-page pamphlet, issued by the Pacific Coast Borax Co., which it is claimed demonstrates "the innocence of Borax and Boric Acid as Food Preservers." Fifteen pages of this pamphlet are devoted to a re-print of a report by Prof. R. H. Chittenden, of Yale University, of some experiments conducted by him to ascertain, as he claims, "the action of borax and boracic acid in the alimentary tract." This report was originally published, according to this re-print, in February, 1892, in the "Dietetic and Hygienic Gazette," and its general conclusions are:

"It is thus evident that borax and boracic acid when present in the stomach and intestine in moderate quantities can have little or no injurious effect upon the more important chemical processes of digestion. On the contrary, the presence of these agents may, in some cases at least, even accelerate the normal digestive processes of the alimentary tract."

One would naturally suppose that conclusions so broad as these, coming from such a source, would have defensible facts behind them. At least there should have been some careful experiments with "these agents" in the "alimentary tract" of some man or beast, but strange as this may seem, this Professor reports nothing of the kind. All his experiments were conducted in his laboratory with carefully prepared "perfectly neutral starch," specially treated "egg-albumen" and "washed blood-fibrin, purified by boiling with water, alcohol and ether" and these subjected to various macerating processes in his test tubes, employing "human mixed saliva" for the starches, and "artificial gastric juice" for the proteids, with varying amounts of borax and boracic acid.

It does not require any very profound knowledge of the laws of evidence to be able to see that the conclusions do not follow from the facts. For example: (1) What may happen in a glass test tube with artificial digestive fluids may or may not take place in the "all-

montary tract" with the natural fluids. (2) If it could be demonstrated that borax did not interfere directly with digestion "per se," it would not follow that its effect upon the system would not be deleterious and cumulative. (3) If it could be established beyond a question that borax taken into the stomach with the food did not materially interfere with digestion, it would be quite unsafe to conclude that milk or meat sometime previously treated with borax would be as easily and readily digested as normal milk or meat. (4) Many other specifications could be added, but the foregoing amply suffice for our present purpose, which is simply to show that Prof. Chittenden, however competent he may be as a chemist, is totally incompetent whether as an advocate or an umpire, and is as easily misled as a child.

For our own further assurance, as well as for the added weight of his acknowledged authority as a chemist, we caused a copy of Prof. Chittenden's report to be submitted to Dr. Babcock for his opinion and submit the following paragraph from his reply, and call particular attention to that part of it which suggests that fatal doses of morphine or strychnine might be added to these artificial digestive fluids without impairing their efficacy. Dr Babcock says:

This report is very misleading and will, I am sure, give a wrong impression to nearly every one who reads it, for the general public will infer that these results, obtained by artificial digestion experiments, are conclusive regarding the physiological action of borax and boracic acid. In reality they have no relation to each other. There are, indeed, many active poisons which have very little influence upon artificial digestion. If Professor Chittenden had added morphine or strychnine to his digestive fluids in much larger quantities than would amount to a fatal dose if taken into the stomach, they might, I believe, have produced as little effect as did borax or boracic acid, in which case the same conclusion would be reached as with borax, that these poisons "have little or no injurious effect upon one more important chemical processes of digestion." Dealers in these poisons might use such a report for "demonstrating the innocence" of them when used as condiments with as much propriety as the borax companies have the present report of Prof. Chittenden.

If it should be observed that Prof. Chittenden's report was made more than five years ago, and hence concluded that "Hoard's Dairyman" is somewhat late in calling attention to its fallacies, the answer is that this corpse so long ago buried and forgotten has been recently exhumed by the Pacific Coast Borax Co., and galvanized into seeming life again by a "quasi" endorsement from Prof. Wickson, of the California Agricultural Experiment Station.

"Hoard."

Household Matters.

BROWN—Escalloped calf's head may be made from the pieces of meat left over from calf's head soup. Place a layer in the bottom of the baking-dish, then a layer of tomato, then a sprinkling of bread-crumbs, half a teaspoonful of celery seed, a layer of chopped parsley, and a dusting of pepper; than another layer of meat, tomato, bread-crumbs, and so on until the dish is filled, having the last layer bread-crumbs. Put over the top a tablespoonful of butter cut into bits; bake in a moderate over thirty minutes. Delicious calf's head hash may be made by chopping rather fine the bits left over from mock turtle soup. Put one tablespoonful of butter and one of flour in the saucepan, work carefully, and stir in half a pint of cold milk. Stir continually until boiling. Add a teaspoonful of salt and half a teaspoonful of pepper and the chopped calf's head Have ready squares of nicely-toasted bread. Heap the hash on each square. Garnish the dish with celery tips and serve at once. If this is to be used as a dish for luncheon the top of each square may be capped with a poached egg.

For chicken salad use the white meat of a chicken only, unless the chicken is not over a year old and has been carefully fed, then the dark meat will be almost as white as the white meat and may be used. The chicken should be boiled carefully. When perfectly cold remove the meat from the bones, carefully rejecting all fat and skin. Cut the meat into dice, measure, and allow two-thirds as much white celery cut into pieces of the same size. Put both aside in separate dishes. Put the yolks of three eggs into a clean, cold bowl Beat for just a moment and add a quarter of a teaspoonful of salt, a dash of red pepper, and then, drop by drop, half a pint of salad oil. Stir rapidly. The dressing should be very thick and grow gradually thicker until the last drop of oil is added. Add a teaspoonful of lemon juice and a teaspoonful of tarragon vinegar; mix and it is ready to use. First mix the chicken and celery together; sprinkle over a teaspoonful of salt, a quarter of a teaspoonful of white pepper; pour over a portion of the salad dressing, and mix thoroughly. Dish on lettuce leaves, put over the remaining quantity of dressing and serve at once.

BAKED CALF'S LIVER.

Carefully prepare a calf's liver, and lard it thickly over the top, with the lardoons sufficiently large to fill a good-sized larding needle. Into the bottom of the baking-pan put a small onion sliced, a carrot sliced, a stick of celery cut into pieces, two bay leaves, a sprig of parsley, four cloves and a teaspoonful of pepper corns. If without the latter, use the ordinary ground pepper, but only one-quarter the quantity. Place liver on top of these: add one quart of boiling water, in which you have dissolved a teaspoonful of salt. Cover the pan with another of the same size, bake in a quick oven one hour, basting every fifteen minutes. Remove the upper pan and bake thirty minutes longer. Serve with a brown sauce made from the liquor in the pan.

BREADED VEAL CUTLETS.

The flesh of veal should be firm with a pinkish tinge, and the bones well formed and hard. Young veal is not only unwholesome but dangerous. For cutlets use a full slice one inch thick from the leg; trim off the skin and cut the meat into squares of about two inches. The formation of this portion of the leg is such that it is quite impossible to make the pieces uniform. Where two small pieces come in a cut fasten them together with a small wooden skewer, leaving sufficient of the skewer in sight to enable one to easily remove it before serving. Dust these lightly with pepper, dip them in beaten egg and then in breadcrumbs; sprinkle lightly with salt, and have ready a pan of hot fat. Put a few at a time of these squares into your frying-basket, sink them in the hot fat, and fry slowly for at least five minutes. Drain them on soft paper, dish on a hot platter, and serve them with tomato sauce. The cutlet may also be fried whole. Dust in flour, and fry in a small quantity of hot fat. Serve on a hot platter garnished with parsley.

It does seem strange in these days of advancement that in some of the country places there still exist the old superstition hat certain parts of an animal are unfit to eat.

Thus depriving themselves of many good wholesome dishes, changes which nature craves for, and to say the least are tempting to the appetite of many.

The value of these castaways ought surely to be appreciated where the people depend entirely upon the supply of fresh meat on the chance of a neighbour killing an animal and exchanging or selling part of it. Take, for instance, calf's liver, which we town folks are glad to pay a good price for, and think it a delicacy in the very early spring, and to see the disgusted look on the servants face who tells you that at home they never eat this, but throw it out.

Let us hope that the pigs or chickens profit by this waste.

HOW TO PREPARE AND COOK A CALVES HEAD.

Put it in a tub and cover with boiling water, and let it stay there till the hair will scrape off easily. Now split it in two, take out the brains and take off the little film that covers them, putting them in salt and water till wanted.

Chop and take out the bone, leaving the skin only cutting off just the very end. The eyes can easily be got out with a steel fork: a sharp knife will do the rest. Cut the ears away so as to be able to scrape and clean out that part. Wash well and boil the head till quite tender.

Boil the brains in milk and cut them up a little for the sauce, with a little pepper and salt, pour this over the head in a flat dish, garnish round with bits of parsley and some slices of good boiled pork and you will have a dinner not to be sneered at.

The Horse.

THE CANADIAN HORSE-TRADE.

Drift of Canadian horse-trade to England instead of the U. S.—Numbers of foreign horses bought in England every year—American horses extensively imported and well-liked—Colonial horses compared with British ones—Faults of Canadian half-breds compared to English ones.

Since the last two or three years, all the most saleable horses raised in Canada, have been going to England, instead of to the United States.

Of course the horses exported from Montreal, all summer, and via Boston, during the winter, are bought by dealers in Ontario. They would buy them here, if they were to be found, but they are not. Wherever good horses are bred, dealers will find their way there to buy them from the farmers It is rather surprising that there should be such a demand, for foreign horses, in England, the horsiest country in the world, but that the demand does exist, and that England is at present our best market, even for some rather inferior classes of horses, there can be no doubt. Probably the explanation can be found in the fact, that English farmers breed very few horses, at all at present, or if they do, only very expensive ones, and prefer to buy cheap ones.

Some years ago, Mr. Pease, an ex-member of Parliament and practical horse-breeder himself, wrote a series of articles on horse breeding for farmers to the "Country Gentleman," and in his introduction expressed himself as follow:

I am in Algeria, a country where the love of horses and the study of methods of rearing, training and perfecting them is great; and, here, there are useful lessons to be learned and mistakes noted. Many think the Englishman has little to learn from the foreigner, on any subject, especially horses. I confess to a different opinion, for I see efforts made, both "here" and on the continent and in other countries which bid us look to our laurels.

The Germans, French, Hungarians, Belgians and Russians have already flogged us in the carriage horse, omnibus, and tram-car horse trade. I found some years ago that the best hays and browns for harness work were coming from Germany and Normandy and I visited the former country to see how it was done and I returned a sadder, and, I trust a wiser man.

Each year shows a great increase in the number of horses imported into England. How is it that we leave it to the Frenchman, the German, the Belgian and the American to supply our "Queen," our nobility, our gentry, brewers, millers, tradesmen, etc, with horses for their work. Are not our pastures, is not our climate, are not our native breeds most suitable, and have we not the best of markets at our door?

I can picture a reader saying: we do, in England, export great numbers of horses. Yes, we do, but few are sold abroad in comparison to those bought abroad, and those that are bought are those got by imported English sires. The American carriage horses are the best, the result of great and long continued importations of English blood into the States. The Oldenburgh horses that draw the Queen's carriages, are of the Yorkshire bay or Cleveland type, bred in Germany. So examine the problem, how we will, we are driven to the humiliating confession, that we have allowed the foreigner to do, to our loss, what we could have done to our profit. One of the curious things that strikes the enquirer into this subject, is that in certain parts of the United Kingdom, the farmer is a horse breeder, and, in other parts naturally more favoured, and nearer market, he seems to know and care little about it. Ireland contains perhaps the best horse breeding districts, and high priced well bred young Irish carriage horses and hunters are bred by small farmers, who would be poor men but for this source of income. Why is the average Irish half bred or hunter superior to the English?

While not agreeing with every thing the above writer says, he is in the main correct, and while allowing unquestioned superiority in the matter of very high class hunters, and the very highest stamps of harness horse, I think that the average excellence of the Canadian half bred as compared to the English one, compares very favorably at the present moment. There has been many an Ontario bred hunter, carrying his owner across country in England last winter, that his owner has bought under the firm impression that he came from the Emerald Isle, and there are many American bred carriage horses doing duty as such in front of well appointed equipages in the park that never came from the Yorkshire wolds.

There is nothing in the way of climate or the nature of the soil in our Province, to prevent our farmers breeding good horses,provided they are within reach of proper stallions, and own sufficiently good mares, which they can either buy or breed for themselves, unfortunately a great many do not know either the right kind of stallion or the right kind of mare to breed from in order to produce a useful or valuable half bred. The great beauty about English and Irish half-breds is that they are generally well topped, their chief defect that they are inclined to be poor below the knees and hocks.

Lack of substance in the bone of the legs and undue uprightness of pasterns is but too apparent in the English thoroughbred of to day; good carriage of head and neck, well-rounded and well ribbed up barrel, powerfuly loins, more or less horizontal croup and muscular gaskins are certainly amongst their good points, and are the products,to a certain extent, of good-feeding and careful breeding. In my judgment it is the sense, knowledge and appreciation of the breeder, rather than anything in soil or climate that gives the Irish horse his name for substance, quality and hardihood. The Irish breeder knows that there is no more valuable animal than a strong well-bred horse, and he sets himself to produce one full of activity, quality and strength. By avoiding hairy legged mares and by using the best sire he can obtain, he succeeds in turning out the best and hardiest carriage horses and hunters.

I regard the average superiority of Irish half breds over English as being due to their keeping clear of cart blood. Many English farmers make the mistake of thinking that they can breed good half-breds off cart-mares, Here and there may be a high couraged cart mare with quality may breed a useful half-bred, but cart-mares had far better be kept for the propagation of their own kind. I have little hesitation in saying that 80 per cent of English weight-carriers are bred this way, and a more ugly, unsatisfactory dangerous, slovenly, faint-hearted animal than the average English weight-carrier is hard to imagine. For real wear and tear harness work the carting strain is equally bad. The Irish and American carriage horse free from all cross of cart-blood, can do more work, do it faster, do it more cheerfully and courageously, and wear far longer,than the carriage horse, which has that cross of cart-blood, which, if even two generations back, will show itself in gradual loss of courage in hard work, and general want of bottom and wearing qualities, careful management.

Captain Horace Hays, speaking of English and Colonial horses, (not including Canada however; as he seems to have no knowlegge of Canadian horses,) says: The large majority of our hunters and saddle hacks are disfigured by cart-blood and consequently have too thick shoulders. The Shire horse is a model of gigantic strength but he often fails in his hocks and feet. The Shire and the Clydesdale seem equally inclined to contract foot trouble such as laminitis (fever in the feet) and sidebones. The Chestnut Suffolk horses are a beautiful breed of compact smart cart animals, which are admirably fitted for agricultural work. England does not seem to lend itself well to the production of very large racehorses. I think that, in comparison say, with Australasia thoroughbreds under 15.2, in England would be found to be better than those over that height.

The special good points of Australian, Tasmanian and New Zealand horses, from a saddle point of view, are their excellent flat shoulders, light necks, well-shaped legs and sound feet. The Antipodes seem to be far more favorable for the production of thoroughbreds with large bone and substance than is England. Hence, we find, in these colonies, a comparatively large number of animals of the weight carrying hunter and charger type, which have little or no stain in their pedigree. On the other hand, although thoroughbreds, in England, have a greater tendency to run light, than in Australia, they certainly show more quality than those of any other country.

The great fault of Canadian half-breds, as a rule, is a very general want of evenness of conformation which gives the effect of two different horses joined together by the middle.

A very common instance being of a carriage pair, with nice light heads, powerful necks and shoulders, and well-shaped fore legs, but with everything behind the saddle place, very light and weak, and not at all in proportion to the fore-part. A general absence of well-rounded barrels, powerful loins, shapely hind-quarters is very noticeable.

C. F. BOUTHILLIER.

Mr. Buchanan's Visits.

PONT LAVAL CONVENT.

In the beginning of last March I was invited by Messrs Notte and Vanier of St. Martin to pay a visit to the Sisters of the Good Shepherd, at Pont Laval to have a conversation with the Mother Superior on Agriculture. I visited all the establishment the same day. They have been there since Dec. 10, 1895 and have done a great deal in that time. By Sept. 1, 1896 they had prepared a building for the children, 148 x 28 ft. with a wing 122 x 45 with class rooms, dormitories and a chapel. The first floor is used as an industrial school where all kinds of work are taught such as sewing, knitting etc.

They have the advantage of water power which helps them very much in their enterprise. A dynamo generates power for the electric light and for the laundry. I was much pleased to see the way the young girls were taught and what nice work they did in sewing etc., and also the assistance they gave in the laundry.

It is a great blessing to have such a home for such children, mostly orphans and some even worse off, who had bad parents, to have the advantage of such good teaching. I think it would be the means of keeping many of our young girls from falling if they could have such teaching in their younger days.

They started in Sept. 1896 with 60 children and at present have 155. I understand the Government only gives a grant for 30. In a few cases a small compensation is received, say $2.00 or $3.00 per month but the majority are kept for charity. It seems to me that if the Government would look into this matter they would try to give them a grant for at least one half the children.

It would give the Superior an opportunity of taking more and they would have more means. In regard to the farm; they have 196 acres of pretty good land, but it has certainly been neglected. It is both run out and dirty but can be made a good farm. It will take a few years to get it laid out and in a system of rotation. At present they have 24 cows and 6 horses. The buildings are very old, but they purpose building in a year or so. I mean to give them all the assistance I can in the way of advice in farming etc., gratis, so well am I pleased with the good work they are doing. I will give a fuller report later on, from time to time.

GEO. BUCHANAN.

Côte St. Michel, May 20th 1897.

Orchard and Garden.

WAX FOR GRAFTING, &c

III.- FRENCH AND PITCH WAXES.

11.—COMMON FRENCH.—Pitch, ½ pound; beeswax, ½ pound; cow-dung, 1 pound. Boil together, melt, and apply with a brush.

12.—COMMON FRENCH BANDAGE WAX.—Equal parts of beeswax, turpentine and resin. While warm spread on strips of coarse cotton or strong paper.

13.—GRAFTING CLAY.—1-3 cow-dung, free from straw, and 2-3 clay, or clayey loam, with a little hair, like that used in plaster, to prevent its cracking Beat and temper it for two or three days, until it is thoroughly incorporated. When used, it should be of such a consistency as to be easily put on and shaped with the hands.

14.—2 pounds 12 ounces of resin and 1 pound 11 ounces of Burgundy pitch. At the same time, melt 9 ounces of tallow; pour the latter into the former, while both are hot, and stir the mixture thoroughly. Then add 18 ounces of red ochre, dropping it in gradually and stirring the mixture at the same time.

15.—Black pitch, 28 parts, Burgundy pitch, 28 parts; beeswax, 16 parts; grease, 14 parts; yellow ochre, 14 parts.

16.—Black pitch, 28 parts; Burgundy pitch, 28 pounds; yellow wax, 16 pounds; suet or tallow, 14 pounds; sifted ashes, 14 pounds. When used, warm sufficiently to make it liquid.

17.—Melt together 1¼ pounds of clear resin and ¾ pound of white pitch. At the same time melt ¼ pound of tallow. Pour the melted tallow into the first mixture, and stir vigorously. Then, before the stuff cools, add, slowly stirring meantime, ½ pound of Venetian red. This may be used warm or cold.

IV.—WAXED STRING AND BANDAGE.

18.—WAXED STRING FOR ROOT-GRAFTING.—Into a kettle of melted wax place balls of No. 18 knitting-cotton. Turn the balls frequently, and in five minutes they will be thoroughly saturated, when they are dried and put away for future use.

This material is strong enough, and at the same time breaks so easily as not to injure the hands. Any of the resin and beeswax waxes may be used. When the string is used it should be warm enough to stick without tying.

19.—WAXED CLOTH.—Old calico or thin muslin is rolled on a stick and placed in melted wax. When saturated, it is allowed to cool by being unrolled on a bench. It is then cut in strips to suit.

V.—WAXES FOR WOUNDS.

20.—Any of the more adhesive grafting waxes are excellent for dressing wounds, although most of them cleave off after the first year. Stiff and ochreous paints are also good. Tar is useful.

21.—COAL-TAR.—Apply a coating of coal-tar to the wound, which has first been pared and smoothed. If the wound contains a hole, plug it with seasoned wood.

22.—HOSKINS' WAX.—Boil pine-tar slowly for three or four hours; add ½ pound of beeswax to a quart of the tar. Have ready some dry and finely sifted clay, and when the mixture of tar and wax is partly cold, stir into the above named quantity about 12 ounces of the clay; continue the stirring until the mixture is so stiff and so nearly cool that the clay will not settle. This is soft enough in mild weather to be easily applied with a knife or spatula.

23.—SCHAEFELL'S HEALING-PAINT.—Boil linseed oil (free from cotton-seed oil) one hour, with an ounce of litharge to each pint of oil; then stir in sifted wood ashes until the paint is of the proper consistency. Pare the bark until smooth, as the fuzzy edge left by the saw will cause it to die back. Paint the wound over in dry weather, and if the wound is very large cover with a gunny-sack.

24.—TAR FOR BLEEDING IN VINES.—Add to tar about 3 or 4 times its weight of powdered slate or some similar substance.

25.—HOT IRON FOR BLEEDING IN VINES.—Apply a hot iron to the bare surface until it is charred, and then rub into the charred surface a paste made of newly burnt lime and grease.

26.—COLLODION FOR BLEEDING IN VINES.—In some extreme cases 2 or 3 coats will be needed, in which case allow the collodion to form a film before applying another coat. Pharmaceutical collodion is better than photographic.

Special Notices.

Salt as an Insecticide.

The use of Salt as an Insecticide, or vermin destroyer, is not sufficiently known amongst the farming community. Many a farmer has lost dollars and dollars simply because he did not know what virtue there is in salt. How many times has a farmer ploughed up acres of crop, attacked by some worm or caterpillar, re-sown the land and all because he did not know that Salt would have killed the worms, and improved his crop. Last year a case was reported through the press and vouched for as correct. A farmer had a ten acre field of oats, attacked by the army worm. The whole ten acres was in such a condition he decided to plough them all up and re-sow. As an experiment he left an acre to which he gave a dressing of 300 lbs. of refuse salt. Three days afterwards he gave the same acre another 300 lbs of refuse salt. The result was, that on that acre, he had a good yield of oats, and had he only known he might have saved the whole ten acres. Salt for such purposes is simply invaluable.

Good for Enlarged Tendons.

"The Lawrence-Williams Co.,
Cleveland, O.

The bottle of Caustic Balsam you so kindly sent me in November, '96 I have used on my horse for enlarged tendon and found it to work to my entire satisfaction, and would recommend it to all horsemen instead of using the firing irons as it has given a better result. R O'SHAUGHNESSY & Co,
April 27, 1897. St John, N. B"