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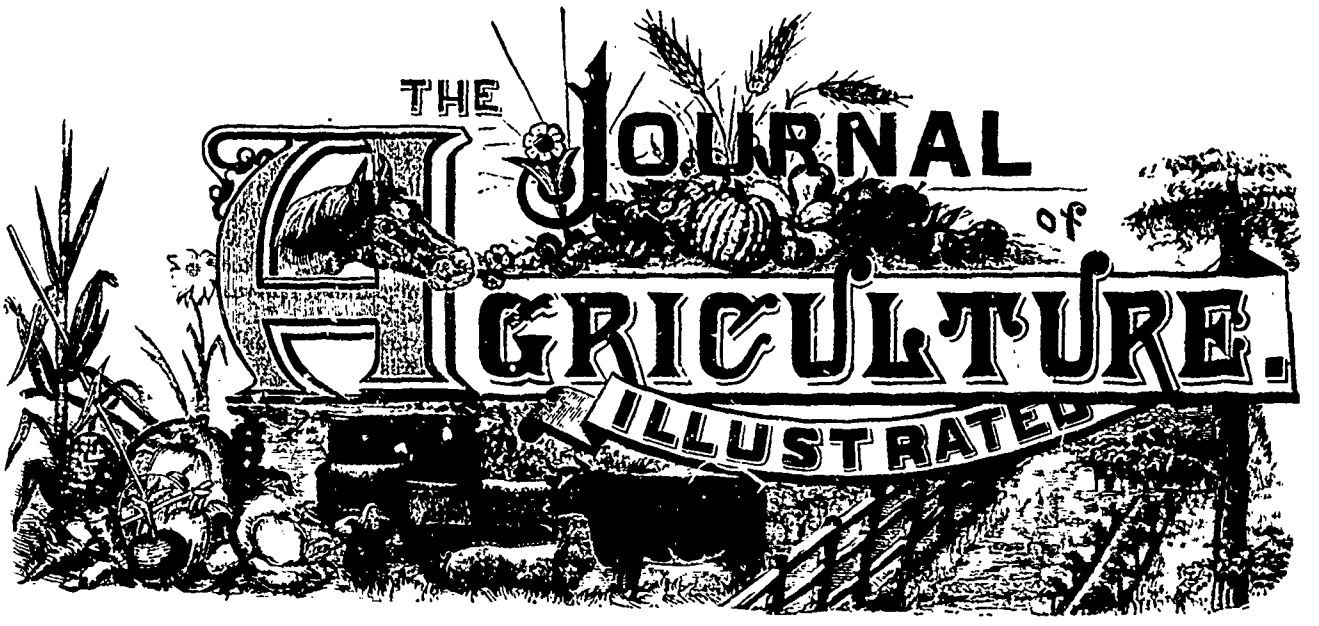

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CLOVER SICKNESS.

SIR JOHN BENNET LAWES, BART, LL.D. F.R.S.

A SHORT time ago Professor Scott delivered a lecture before the London Farmers' Club upon the "Recent Advances in the Science and Practice of Agriculture."

Amongst other subjects he referred to potato disease and clover sickness, and in reference to the latter mentioned that at Rothamsted upon a garden soil, without further manuring I had grown red clover for 28 years in succession.

The discussion which followed turned a good deal upon clover sickness; and one of the members who had recently returned from the States—after giving his experience with regard to the disease following a too frequent repetition of the crop—mentioned that at a meeting of one of the Granges in America he was called upon to speak and "Amongst other things," he said, "I mentioned clover sick land, and directly after I sat down, a lady got up and began to ridicule the farmers of England, and the scientific men of England, because they could not, in their scientific researches, find out some remedy for this great evil."

To the best of my belief nowhere but at Rothamsted has any attempt been made, up to the present time, to find out why red clover would not grow continuously upon the same land.

In the year 1848, having some acres of clover in one of our fields, we decided to apply a variety of manures to the crop and to restore it if it died away. I have no intention of giving a history of all our failures, but will merely mention the fact that after twenty-two years, feeling somewhat weary of wasting money on several acres of land without being able to arrive at any definite results as regarded the object of our investigations, I left Dr. Gilbert to go on with the experiment on a more confined area, thinking that a few square yards would prove equally as well as some acres of land whether the crop of clover could be grown continuously or not. I may say, however, that the last ten years have given no more successful results than the twenty-two years that preceded them.

Upon the remainder of the land—which had been under clover experiment for twenty-two years—I have now for some years been trying to grow other plants of the same order; and in addition to the red clover, I have five other clovers, and nine other agricultural crops of the leguminous order.

I may mention here that, as far as chemical composition is concerned, the Leguminosæ bear a very close relation to each other, and the same is the case with the graminaceous crops; while there is a marked difference between beans and wheat, or peas and barley, the distinction between the various plants of the same order—whether we take the whole plant or the seed alone—is very slight; wheat barley, corn and rice closely resemble each other. My object therefore in carrying out this experiment was to ascertain whether the land was only clover-sick, or whether it would refuse to grow any other crop of the same order.

With this view I sowed three red clovers, three white clovers, two yellow trefoils, the scarlet trifolium, the purple lucerne, the red sainfoin, the pink clover, the vigorous Bokhara clover, and the purple vetch; every one of these had the option of feeding upon thirty-four different combinations

of manures, each of which differed more or less from the other. This experiment has now been going on for several years, but I propose to give merely the result of a competitive examination made at the end of May of the present year.

Before going into the field I decided on classing the various crops under three heads:

1. Good: which should represent a fair agricultural crop.
2. Very good: where the produce was much in excess of an ordinary crop.
3. Bad: where the produce was much below that of an ordinary crop.

Each crop had, so to speak, thirty-four chances, having the opportunity of producing a good result under any one of the thirty-four manures.

The whole of this portion of the field has been under experiment since 1848, its condition therefore with regard to manures is well known. Since 1854 no dung has been applied and, upon certain portions of the land, no substance containing nitrogen has been used since the commencement of the experiment in 1848

The result of the examination brought out the following facts: Five of the different crops grown, sainfoin, tares, Bokhara clover, lucerne and trifolium, under every one of the thirty-four different manures, came under the class described as good, or very good. Four of the other crops have the large majority good or very good; four have the majority bad, but the only crop which is bad throughout the whole of the thirty-four varieties of manuring is the ordinary red clover.

It so happens that this red clover adjoins the sainfoin which is a good or a very good crop under every variety of manuring. In no case is the sainfoin less than 18 inches high, while in several cases it is between two and three feet high and very thick upon the ground; the red clover, on the other hand, is not more than two or three inches above the ground, and although the plant is not diseased there is no active growth.

Passing from this field, let us now go into another where an experiment on an ordinary four-course rotation of turnips, barley, clover and wheat, was commenced in 1848, and has been carried on, *without any application of manure to the soil, from that day to the present time.*

The third crop in the rotation was clover and a very large produce was carried off, but as usual when the attempt was made to repeat the crop *after an interval of four years* it failed. Beans were then tried in place of the clover, and they were repeated every fourth year until 1873, when red clover was sown with the barley The crop was not diseased in any way and it stood the winter, but there was no active growth; and the hay, which was cut three times, only weighed 1½ ton per acre. A crop of beans was taken in the fourth following year, and red clover was again tried with the barley in 1881; the crop as on the previous occasion, stood the winter well, and there is an excellent plant at the time I am writing, but the produce is very small and would hardly pay for the expense of cutting.

In another experiment in the same field where the turnips in the rotation have received a very liberal application of artificial manures every fourth year from the commencement, the clover is an exceedingly large crop.

When this land was first put under experiment in 1848, it was in what we should describe as rather high agricultural condition; *the failure of the clover crop when repeated in the seventh year from the commencement, could not therefore be due to want of food in the soil*, as in the interval between 1854 and 1874 the removal of twenty unmanured crops must have greatly impoverished the land, yet we still obtained a crop, though a very small one, and even eight years later than this date we got a crop without disease. We have therefore before us the singular fact that disease is not due to poverty of the soil; and that it is not due to richness of the soil is proved by our having succeeded in growing continuous clover crops upon a rich garden soil.

Here I may observe that the remarkable circumstance of other leguminous plants growing luxuriantly where clover would not grow must not lead us to conclude too hastily that we can *continue* to grow them; after a few years they may in their turn fail just as the red clover has failed.

I have not referred to the numerous analyses which have been made of both soils and crops in connection with this subject; nor even to the elaborate operations carried on by Dr. Gilbert on his small beds, in which he placed the various manure ingredients in layers, several feet below the surface.

My object is to point out to those of my American readers who are interested in the subject, and to the lady—who I am sorry to find has so low an opinion of the farmers and scientific men of England—that here, at least, some attempts have been made to investigate the causes of clover sickness; and it is not from any sparing of time or money bestowed upon the subject if the results have not as yet proved altogether successful.

Rothamsted.

VETERINARY DEPARTMENT.

Under the management of D. McEachran F. R. C. V. S.

(*Address P. O. Box* 1265, *Montreal.*)

THE MANAGEMENT OF BROOD MARES.

At this season of the year, the greatest care is necessary in managing mares in foal, and especially during such a winter as we are now experiencing. The pregnant mare should always be kept in a loose-box, or, where that is not convenient, in a large stall, so as to avoid risk of injury from being cast in a narrow stall.

If she has been accustomed to work, she should be kept at slow work up to within two or three months of foaling. She should never be driven fast, nor made to draw heavy loads; sudden starting and rapid pace are to be avoided. Deep snow and *cahots* are apt to lead to straining and jerking, which by injuring the fœtal membranes, induce abortion, a matter of serious loss to the owner; consequently, pregnant mares should only be driven on well beaten, smooth roads. It is well known to all breeders of horses that a drink of cold water taken by the mare will cause the foal in the uterus to kick; this plan is often resorted to as a proof of pregnancy. The movements of the foal in this instance are due to the chill caused by the cold water producing pain or uneasiness, hence, we infer that cold water in quantity is injurious to the foal. The water should always be allowed to stand in the stable, or have the chill taken off it by the addition of a little warm water, before a pregnant mare is allowed to drink it. It is important that she be kept in good condition, but high flesh should be avoided.

It is necessary, too, that the food should be easily digested, and not too bulky; unless regularly worked, dry grain is not advisable, crushed oats and bran, carrots, boiled oats or barley, with bran and hay, constitute good feeding for them; but corn, oats, and such stimulating food must be avoided.

A costive condition should be counteracted by a pint of raw linseed oil occasionally.

Some mares are apt to swell in the legs, and under the belly, during the last two or three months of pregnancy. Such mares should have a large straw-yard to run in: it is often more alarming in appearance than in reality.

IDLE HORSES.

At this season of the year, when but little work can be done on the farm, the horses which are idle require more care than is usually bestowed on them. They should never be allowed to remain in the stable during the entire twenty-four hours; they should be turned out into the barn-yard for several hours daily, unless they can be exercised at light work. Over, feeding of idle horses, on the whole, produces more injurious effects than under feeding, yet both extremes are to be avoided. Young colts will winter well on good hay, with an occasional feed of ground oats, carrots, or bran mash to prevent costiveness. They should, if possible, be kept in loose-boxes,—not more than two together. The feet require a good deal of care, they should be regularly pared down, made perfectly level, and prevented from getting long at the toe. Working horses whose feet have suffered from shoeing and hard roads can be very much benefited by having the shoes removed, and letting them run for the winter unshod. Unless the bone is diseased, corns and weak heels will recover, and the feet, with a little care and sensible management, will improve in every way.

Care should be taken that when a horse is only to be temporarily idle, the feed should be lessened, and soft diet substituted for the stimulating oats or corn.

DANGER FROM HIGH FEEDING IN IDLE HORSES.

(*Haemaglobinurea.*) Our readers are aware that for the maintenance of the animal body a regular supply of nutrient material must be supplied which is utilized by the digestive system of organs, and converted into such a fluid form as admits of its being absorbed and assimilated by the tissues.

In this way, growth and waste of tissue are provided for, and the size and vigour of the body maintained. It will readily be understood that there is a maximum and minimum limit to the quantity of nutrient material thus required and consumed.

This quantity and kind of food is usually well known to those whose business it is to feed horses—taught by experience—but it is a department of management which is not sufficiently studied by our agriculturists. Yet it is well known that those who are experts in feeding are the most successful. It must be borne in mind, that the more work a horse has to perform, the more nutrient material he will consume; and that horses at hard, regular, daily work, require a liberal allowance of nitrogenous food to compensate for loss of substance in the performance of their work. On the other hand, when idle, the demand is lessened, and capability of consumption is also decreased—consequently, if a horse in vigorous health is, from some cause or other, kept idle for several consecutive days, no change being made in the allowance of nitrogenous food, an accumulation of unabsorbed or unassimilated nitrogenous elements takes place, the blood is surcharged with nutriment, and a plethoric condition is the result.

In such cases the animal spirits are buoyant; when he is taken out, he is playful and inclined to go fast. However, this false animation does not last long—he goes probably half amile, then he stops, perspiration covers his body, he becomes stiff and unable to progress, the loss of power being most apparent in the hind quarters. Sometimes it becomes complete, and he falls down, unable to get up. The muscles of the quarter are swoln and hard, the pulse and breathing quickened, and the urine becomes thick and black, like porter or coffee, is rich in nitrogenous substance and the colouring matter of the blood, and, even under the best of treatment, it often proves fatal.

It is thus evident, that we cannot with impunity continue to feed idle horses as high as when at work.

It should be a rule, never to be deviated from, in every stable, to lessen the quantity of oats or other nitrogenous food when working horse have to be kept idle even for a day or two; not only so, but they should never remain twenty-four hours without exercise.

OTHER EFFECTS OF HIGH FEEDING ON IDLE HORSES.

Swoln legs.—In addition to the system of vessels which carry the blood to and from the tissues, we have a system of absorbent vessels and lymphatic glands whose duty it is to convey the lymph fluids of the body. Under high feeding and want of exercise, these glands, particularly in the hind leg, are apt to become inflamed, producing swelling and intense pain in the groin, and down the leg. It is usually called a *weed*. The swelling is due to interrupted circulations in the vessels which often burst, and the cellular tissues of the leg become infiltrated, the swelling diffused and pitty. With a change of feed, the action of a purgative followed by diuretic, hot fomentations, bandaging, and, when the pain abates, moderate exercise, the swelling usually disappears; but it leaves the vessels weak, dilated, and prone to subsequent attacks.

Cracked Heels.—Debility of the absorbents of the legs tends to induce congestion and inflammation of the sebaceous glands of the legs, particularly in the thin skin covering the hollow of the heels. This tendency, of course, is aggravated by exposure to wet and cold, and the reaction induced by leaving the heels wet to dry spontaneously by evaporation in the stable; but in most cases the direct cause is the plethoric condition owing to high feeding and insufficient exercise.

Thrush is, in many cases, another consequence of dietetic errors, although in some it is due to neglect or mismanagement of the feet themselves.

It consists of a subacute inflammation of the sensitive frog, whereby, instead of the natural tough, elastic horn, a soft pultaceous substance is formed, and discharged from the clefts of the frog, which gives off a most offensive odour. It is attended by tenderness, if not by positive lameness, and may, if neglected, lead to more extensive disease.

First steps in Farming.—Young Man's Department.—Dairy-Cattle.

We all think we know a good cow when we see her; but, in spite of our supposed knowledge of the animal, there are very few good judges of cows to be met with, or else we should not see such extraordinary decisions at our cattle-shows. You know that the desirable qualities of cows vary with the uses they are intended to serve. It would be absurd to look for the points of a shorthorn in a Jersey, or the form of a Devon in an Ayrshire. Each has its own peculiar beauties, and the man who breeds the one is often prejudiced against the other. All breeds are good in their way—one for stall-feeding, another for grazing, a third for milk, and, again, a fourth for butter; and of these several kinds, we must each choose for himself the sort best adapted to the land he occupies and the food he has at hand. It by no means follows, however, as I shall show further on, that because we happen to farm inferior land we must be contented with inferior cattle, for a very small outlay for additional food will make our second, class pastures equal, nay superior, to the best grass-lands in the province.

Now, in judging of dairy-cattle, what are the principal points to be determined? And, first, of the cow: if her digestive powers are imperfect, she won't be worth a farthing. The signs of good digestion are the same in all animals: a large stomach, broad hips, deep loin, and well-rounded ribs; the brisket should be moderately deep and broad, to afford play to the lungs and heart. But here we may note, that,

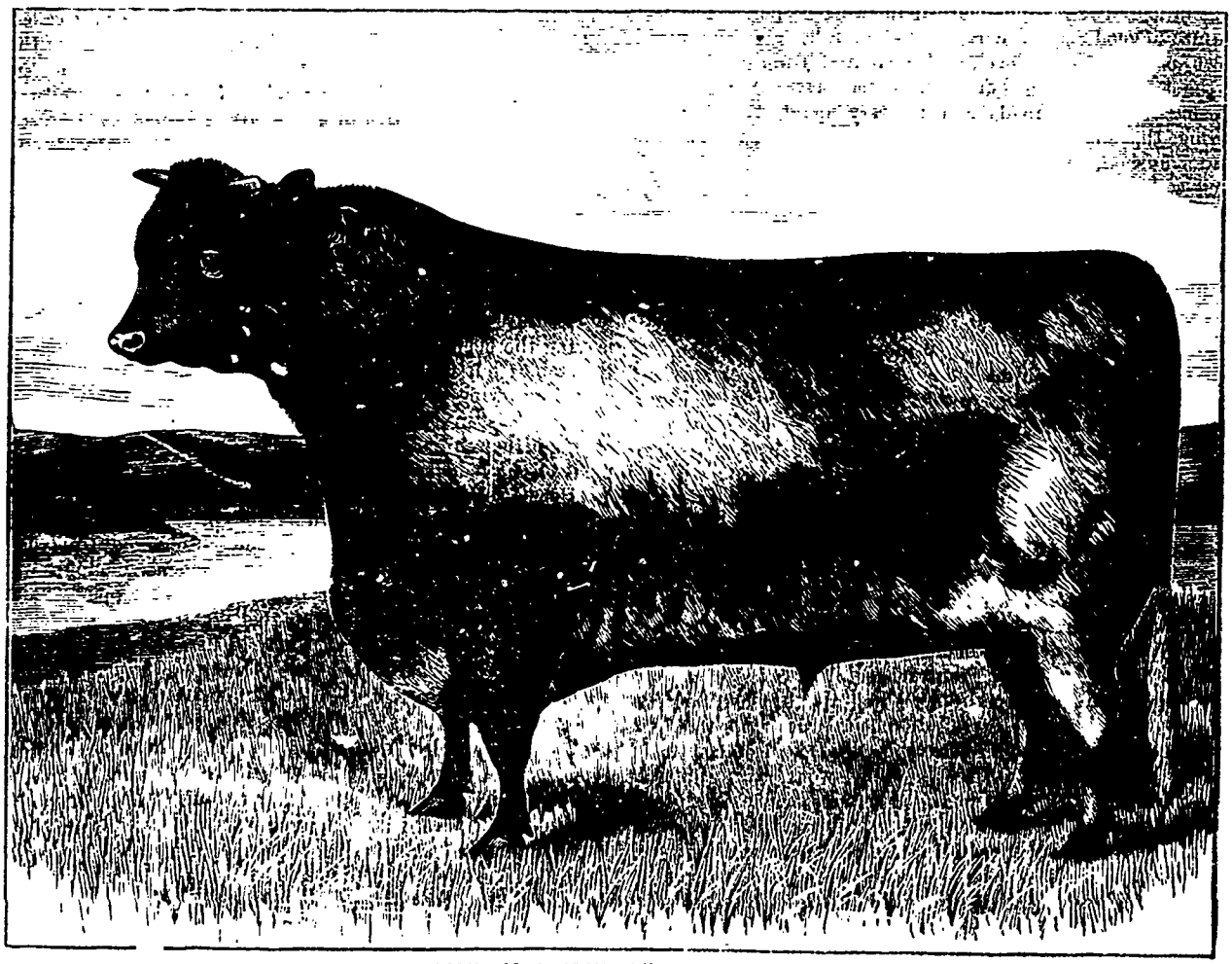
where food is scanty and much ground has to be gone over to find it, the brisket will be narrower than in the reverse case. Thus, for example, the Downs on their native hills are much-narrower before than the same race fed within hurdles (folds) on the turnips of Cambridgeshire and Norfolk, and the brisket of the Devon on the wild moors of Bodmin is a very different thing to the brisket of the shorthorns of Underley or Compton (1).

A good constitution is indicated by several unmistakeable signs: a *kind* head with bright, calm eyes; fine, lustrous hair, and a pliable but not a thick skin—a very different sort of handling skin to that of the shorthorn.

The udder—well, if you have an eye for form, your own taste will guide you in this point. It should be square, broad, well up before and behind, not fleshy, and yet not harsh to the feel. The teats should be equidistant from each other, and of moderate size.

If you intend to sell milk, the colour of the skin of your cow need not trouble you; many perfectly white skinned cows are marvellous milkers. But as you probably intend to make butter, it is as well to know that a yellow-skinned cow is almost invariably a butter-producer.

Look inside her ear, on the point of the shoulder, on the skin covering the bones at each side of the tail-head; and if



FOURTH DUKE OF CLARENCE.

As you will probably want to fatten your cows for the butcher, when they have done their duty in the dairy, you had better not fall too much in love with the *wedge* form. Some of the delicate little Ayrshires to be seen at our shows in the autumn, are perfect models of this style. I do not counsel you to keep this shape in your eye, when you are starting a herd of dairy cattle. A visit to Mr Abbott's herd of Guernseys will amply repay you for the trouble of a journey to St. Anne's, and an hour's study of the two best cows will, if your memory is good, keep you from making mistakes in buying dairy cows for the rest of your life

(1) When I say that the brisket of cattle, on poor land with a great expanse to be gone over before sufficient food can be got to fill the belly, will be narrower, I mean that each succeeding generation will decrease in this point, until what may be termed the normal width is reached

these points are yellow, or, preferentially, orange-coloured, the cow under examination will seldom turn out unprofitable to the dairy. I have, as I have often stated in this journal, my own ideas as to the best style of cow for the general farmer, and I hope to have an opportunity of *showing* what I mean before very long.

Escutcheons, milk-mirrors, and dished faces, I do not bother myself or you about, colours are utterly unworthy of attention—a white shorthorn, in England, fetches as high a price as a red one, if other things are equal, in the States, a white or light-roan is almost unsaleable; and the black Ayrshire in the Rougemont herd is by no means the worst of the lot The raving madness for whole-coloured Jerseys, with black tongues, and black switches, to the almost total neglect of other more important points, has done inconceivable injury

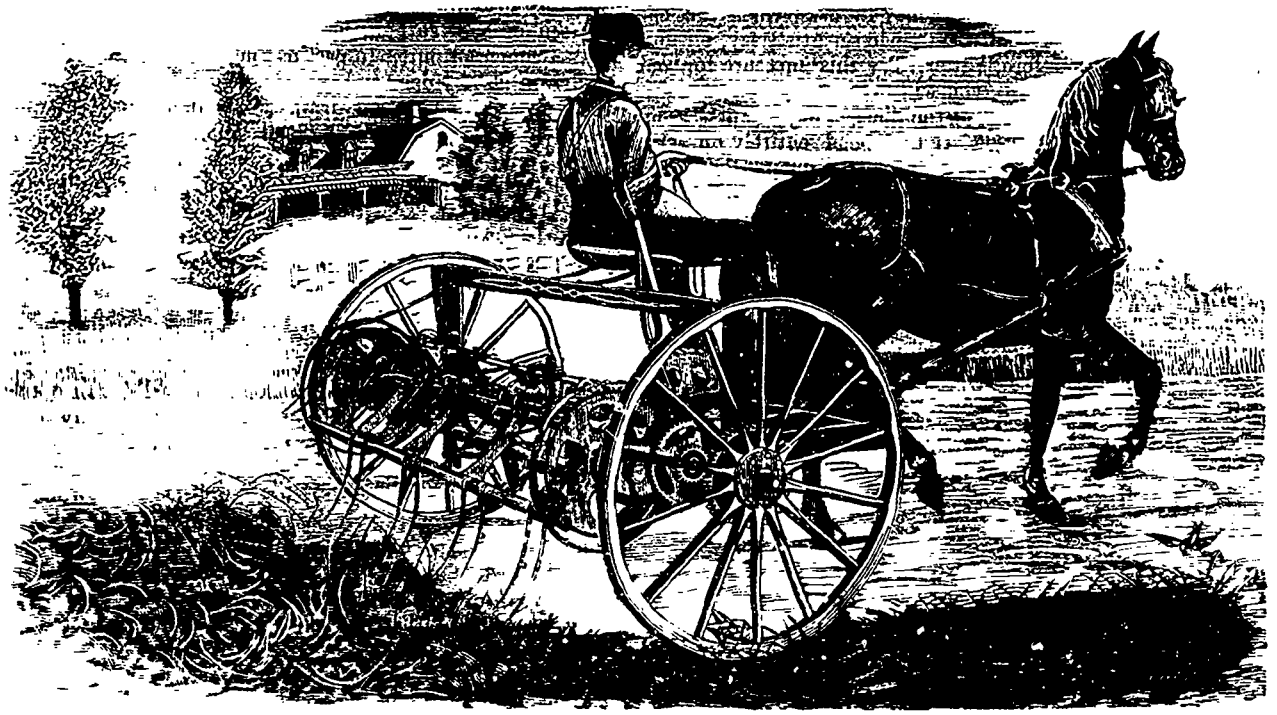
to the breed. Mind, I am speaking to you as to men who look for profit from the herd, not to amateur farmers whose desire is more for beauty and uniformity of appearance.

But the pedigree of your stock is worthy of deep attention. Don't imagine that this is a fanciful point. The old milking families of short horns still retain their pre eminence, (1) and I strongly recommend you, wherever it is possible, to find out the milking power of the dam and granddam of every cow you buy. This, in your case, is *pedigree*, and only fools, and men bigoted in the ways of their ancestors, deride it.

With the bull, you must exercise the same care before purchasing. He must be thoroughbred of his kind : never on any account breed from your own cross-bred male animals until at least four generations of heifers have been topped by pure-bred; less, however,in the case of milch-cows than where beef is the object.

such as I saw not many miles from Montreal a few days ago, weighing about four hundred pounds apiece. No doubt, the owner of these rats was wise in his generation : he was very poor, and farming, on shares, poor, stady soil, a most pitiable man, to my mind, though he appeared happy enough. We know, without seeing, what the state of these animals must be from the first of July till the stubbles are ready. Nothing but a few dried up grass-roots to be torn up for food, when once the little flush of grass is over, except a few potato-peelings, and the dish-water of the house (eugh !) when they come home at night to be milked. Decent sized cattle would of course perish from starvation on such keep.

You, if you mean to farm in this fashion,must be contented with the same sort of stock ; but I hope better things of you. Common sense will tell you that it is better to employ what means you have in cultivating a moderate number of acres



AMERICAN HAY TEDDER.

well, than double the quantity badly ; and in this country, where food is relatively cheap and dairy produce relatively dear, the best and cheapest way of raising the quality of your land is by feeding your stock as it ought to be fed.

And no great outlay will be necessary for this. Fifty cents-worth a week, per head, during three months will make your poor pasture equal to very much dearer land, the yield of milk will be enormously greater, and the soil of the whole farm will, in a very few years, be improved to double its original value.

Your cows will of course run the pastures from the usual time of grass, say, the 25th May to July 1st. About the latter date, the grass will. in most years, be pretty nearly gone, and on the soil we are speaking of, it hardly ever does much good afterwards , the cows fall away in their milk as well as in their flesh,and become utterly unprofitable. Nothing is so expensive as bringing back condition when it has once been lost, except bringing back a flow of milk when it has once begun to decrease. Before it comes to this you will do well to try the following mixture :

I am curious to see how long it will take, on the ranches of our Western prairies, to bring up the produce of the Montana and Texan cows to the stature and form of the shorthorn, polled-Angus, and Hereford sires employed there. You see, the importance of these pure bred males lies in their power of transmitting the qualities of their ancestors to their descendants : vulgarly called pre potency. For my part, I will back the shorthorns to exercise the most influence of the three The Herefords have been carelessly bred until lately, and the polled-Angus, too, was not much looked after until Mr McCombie's time. Yes, I think these half-bred shorthorns will show their descent most.

But to return to our subject : what sized cattle should we keep ? Most people would tell you that the question is a simple one,that the quality of your land must be your guide. I differ entirely from this response, and I will tell you why : the quality of your land is just what you please to make it. If you have a farm of poor soil and choose to keep it so, you must be satisfied with cattle of an inferior sort, little miseries,

(1) The first *Duchess* gave 18 pounds of butter a week!

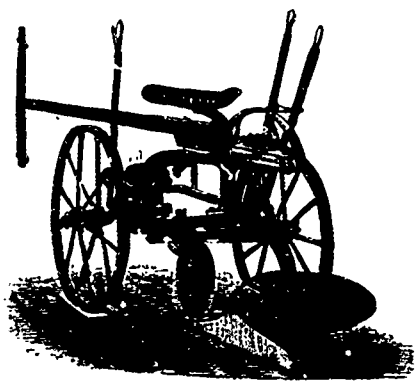
One bushel of linseed
Two do corn
Two do pease

These are to be all ground up together, made into a thick mash with boiling wa. ., and four pounds to be given to each cow at night when she comes home to be milked. The cost is about seven cents a head :

One bushel of linseed	$1.40
Two do corn	1.40
Two do pease.....	1 80
	4.60

The five bushels of mixed grain will weigh about three hundred and two pounds, which will make it as nearly as possible, a cent and a half a pound—a trifle must be allowed for miller's toll. The linseed is high in price, but very cheap in reality. Never fiddle away money in cake when you can get the seed. In spite of all the pseudo scientists say, oil does make fat, and, therefore, butter. Try this mixture for one month, and I do not think you will ever leave it off.

Again, though on account of the uncertainty of our seasons I do not think it would answer to depend entirely on what is commonly called *soiling* for our cattle during the entire summer, still, there should be at all times, after the beginning of July, one or more green-crops ready for the scythe. A piece of vetches, some oats and pease, or *gabourage* as our



RACINE SULKY PLOUGH.

French-Canadian friends call this mixture, but sown much thicker than in their practice—two bushels of pease and two of oats to the acre are not too many—above all, in the light soil we are speaking of, an acre or so of lucerne near the stables ; these with a piece of clover left after haytime, and a trifle of Hungarian grass, to come in towards the middle of October, will send your cows into winter-quarters in good condition, never troubling themselves, or you either, whether their normal weight be six hundred pounds or one thousand two hundred pounds.

You can't do all this at once ; but the sooner you begin to attempt to provide additional food for your cow-stock, the sooner they will begin to pay. For the first few years, the pasture on this light soil will, after June, be nothing more than a promenade for your cattle, but the improvement will soon show itself, and you will find that the extra condition of the land will not only produce much more grass, but it will enable, in some mysterious way, that grass to withstand the scorching rays of a Canadian sun.

I shall probably be regarded as a visionary by many who read this article ; but if they had seen, as I have seen, the Saturday trains on the Eastern Counties' Railway, in England, bringing up their thousands of big, ripe bullocks from the sandy soils of Norfolk, Suffolk, Cambridgeshire, and Essex, which, fifty or sixty years ago, produced nothing but rye and long-legged, black-faced, heath-sheep, they would, perhaps, think me a prophet rather than a dreamer of dreams. I have persuaded more than one Montreal milkman to try the mixture of linseed, corn, and pease, and they speak highly of its effects, as indeed, if fairly tried, everybody must, as it is in accordance with practice as well as with theory.

Whatever produce, beef or skin, wool or mutton, milk or suet, you expect to draw from your flocks and herds, you must first give to them in the shape of food.

Does your cow toss her horns as she leaves the stable ? In doing so she expends a certain amount of energy, and that means a certain amount of food : no movement is made without expenditure of food. I must beg you try to impress this very firmly on your minds, for if you can ever convince yourself of the truth of the proposition, you won't send your cows a couple of miles to pasture, neither will you let them be driven fast by dogs or boys Heat, again, you know, is produced by food. If a cow drinks water at 35° F , that water has to be warmed up in the animal's interior until it reaches 96° F., and this warming up is an expenditure of heat, i. e. food. The best temperature for cattle is 60° F , and if the water troughs are kept full, their drink will always be comforting and pleasant to them, their rest will follow immediately after food, and there will be no staring coats on them.

As to feeding in general, the first thing to be observed is that a certain quantity of food is necessary to keep a cow, or any other beast, in a certain state of condition—a state in which the animal neither improves nor falls back—is stationary, in fact. From the amount of food equal to keeping a cow in this condition you must not expect any milk. Judging from what I see, the idea, here, is, that cows can be kept poor all the winter and give the same amount of milk in spring as if they had been well fed ! According to many trust-worthy experiments, it requires two-thirds of a full ration to keep a cow in fair condition—what is commonly termed " food of support "—before any milk is yielded ; that is to say, two-thirds of the food are expended in keeping the cow alive. Up to that point, all is expenditure, there is no return. What is a cow ? As regards dairy-work, a cow is simply a machine for producing milk, just as a steam-engine is a machine for producing power and motion—if the boiler is supplied with just enough fuel to keep the water at 200° F., no power is gained, as you very well know ; the boiler must receive extra fuel to produce extra heat before any work can be done.

Would you keep a boiler going which required 25o/o more fuel to get up steam than other boilers ? By no means—you would soon make a change. And so with cows. If a cow gives only one thousand two hundred quarts of milk a year, she is not paying you may be sure. A good cow, well fed, should give three thousand quarts a year, that is, she should average ten quarts a day, for 310 days, and the cost of this great yield will be only a trifle more than the cost of the bad cow's yield. You see, now, why I insist so much upon the food *beyond the food of support.*

You will observe that I have great confidence in pease, as a food for milch-cows as well as for young animals—in fact for every creature on the farm young or old, fat or lean—in England I used beans, or lentils, according to market price, but the principle involved is the same in all—nitrogen ! Pease contain of albuminoids. (compounds containing nitrogen) about 24 o/o, oats only 12½ o/o. My favourite linseed, so scornfully treated by the pseudo-scientist, contains only 20½ o/o. of albuminoids, but 35 o/o *of digestible fat.* Corn I

have very little practical experience of : I prefer buying it to growing it ; its chief use in the mixture is to supply the digestible carbo-hydrates, of which it contains 60 o/o. Now, without bothering you about nutritive ratios or any deep calculations, I must ask you to believe that from practical experiments carried on by myself on the one side, and by the Webbs and Jonases on the other, the most prejudiced of men confessed that seven pounds of my mixture (two of linseed to five of pease) with one bushel of turnips, was fully equal in effect to twelve pounds of linseed cake and two bushels of turnips. I substitute corn for half the pease, but, I think, only as a concession ; for in my own practice, I should still use all pease for fatting animals.

Slops will tend to produce milk, but unless dry food is given in abundance with them, the health of the cow will suffer. Brewers' grains, a famous milk-food, if given too freely will rot the animals. Two to three pecks a day is enough for a cow. Malt-dust, or cummins, the roots trodden off the malt after drying, makes good milk and healthy cows : compare its digestible nutrients with those of bran—10,48, 3 ; malt-dust, 20,43, 9. It contains double the albuminoids, almost as much carbhydrates, and only falls short in fat; and yet people willingly pay $20 a ton for bran, and can hardly be got to draw away the malt-dust for nothing. If you try malt-dust, pour *boiling* water over it, with a dash of salt in it. Look after the digestion of your cows, if you don't use linseed, that is, for with it healthiness will be the rule in your herd.

You need not fear shortening the life and usefulness of your cows by high feeding, if you balance their rations judiciously ; but keep their bowels always loose by too much linseed, or always constipated by too many pease, and you will soon find out that, with cows as with human beings, a proper diet is the main [illegible] of health.

Ventilation I hope need not trouble you much with. It will be an insult to suspect any one, now-a-days, of neglecting this matter. One thing I must remind you of : ventilation must not be carried out at the expense of warmth.

I am troubled in my mind about exercise for cow-stock ! When the cattle are all in loose-boxes there need be no anxiety on this head, moving about in freedom in the eight feet or so square allotted to each beast is exercise enough. But we can't afford the space yet in our stables for this most desirable plan. Cows must for a long time be tied up by the head from the middle of November to April — four months and a half of strict confinement, poor things - and yet, I cannot bear the idea of turning them out of the stables into the open air, when the temperature is at or below zero of Fahrenheit. Shall we compromise for half an hour out of doors when the sun is shining or the weather pretty mild ? The young stock there can be no doubt about—plenty of exercise in the open air, and perfect freedom, must be the rule for them.

Riga, Russia, 29 December, 1883.

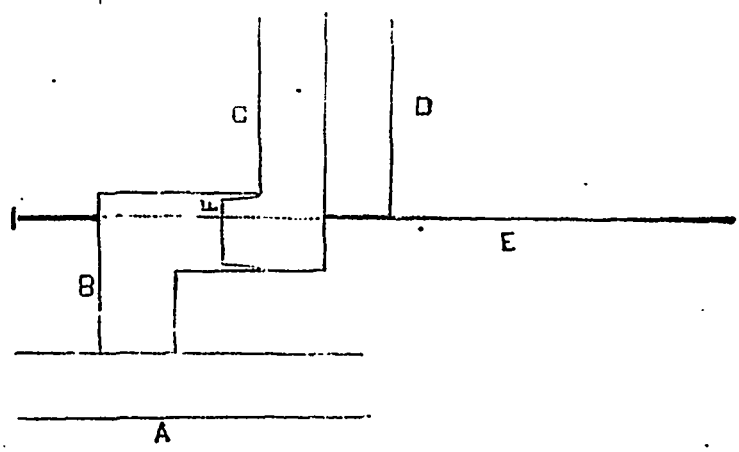
SIR,—Our mutual friend, Mr. Goegginger, gave me insight into several agricultural papers which you had been good enough to send him, among which is the October no. 9, Vol. VI of the Montreal *Journal d'Agriculture.*

On page 14 of the same is given an account and diagram of a domestic *Fruit Evaporator*, which I, doubtless like many others, would fain give a trial to for the purpose of serving as an introduction to larger and more costly apparatuses. However, the author, or translator, seems evidently to have failed in rendering the matter sufficiently plain, even to such a degree as to make it appear doubtful whether, by the description given an apparatus could really be constructed to answer the purpose.

In the uncertainty whether the Editor would take notice of my application as coming from so far distant a stranger, and undertake the trouble of furnishing the requisite additional data, I make free to address your good self, feeling sure that you will not suffer those interested to remain in ignorance where enlightenment had been professed.

The following short literal extracts from said Journal, on comparison with the diagram, will best serve to shew where both of them clash, viz. :—

1o. " Dans la gravure 1 ..... est représenté ..... l'arran-
" gement des tuyaux."



Stovepipe A and elbow B—fixtures. Box D and elbow C turn on support On moving box right or left, support turns on pivots, as does C.

2o. " .....le support parse à travers le centre de la partie
" verticale, tel qu'indiqué dans la gravure 1 par des lignes
" pointillées, ce qui permet aux coudes de former un joint
" mobile et tournant au point où ils se rencontrent en C',
" même gravure."

Now the top part of the gas-tube on which the box hinges, being thus said to pass through the vertical portion of the knee leading into the chimney, as indicated in the diagram, would appear to be intended for the very reverse of what it professes, viz., to make the knee an absolute fixture instead of allowing its joints to turn and play; in addition to which it would puzzle many a non-mechanical mind how to effect joints of a kind to let the knee follow the movements of the box.

Perhaps the Editor will undertake to enlighten his readers on all these matters in an early future number of his Journal, in which event I should hope to be considered entitled to a copy, which I should not fail to submit also to our mutual friend, Mr. Goegginger.

I should be much pleased to receive a few lines from you to say what I may look for and regretting my inability to procure United States or Canadian postage stamps so as to save all expense,

I am, sir, Your obedient servant,

P. VAN DYK.

A CHEAP FRUIT EVAPORATOR.

We have already spoken of an industry which seems to us to be promising, we refer to the drying of fruit by evapora-

tion. The great objection that some of those who would like to embark in the business bring against it is the rather high price of the patent evaporators. As a reply to this we borrow an article, and the explanatory engravings, from *The Rural New Yorker*, showing the way to make a cheap evaporator:

"The majority of farmers live too far from the great evaporators, and they do not grow fruit enough to make it worth their while to buy a patent evaporator. For the sake of these, I send you an engraving, fig. 1, and a description of an apparatus adapted to dry fruit by means of the surplus heat from a kitchen-stove, which is arranged in such a manner that it can be removed from the stove when the latter is wanted for other purposes. The apparatus consists in a hollow case of sheet-iron, open at the bottom, and measuring two feet wide by two and a half feet high. This case contains twelve trays for the fruit, held in their places by small ledges of sheet-iron fastened to the sides. The trays are made of galvanised wire-cloth, number 5, and fastened with tacks to light frames of wood 23¾ inches long and 22 inches wide. They are made expressly two inches in width

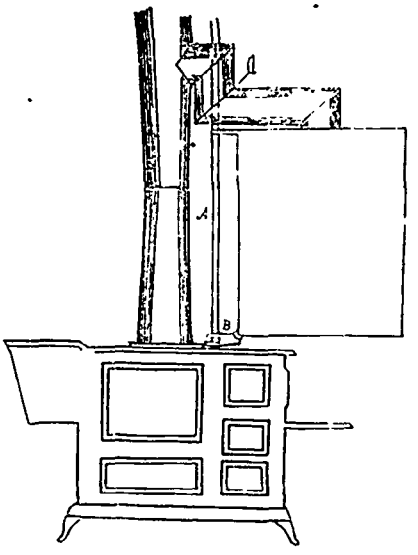


Fig 1.

less than in length, that when charged with fruit the draught of the hot air currents may not be hindered. The frames should be steeped in a saturated solution of alum, which will render them incombustible. As the top of the evaporator is about three feet from the stove, it may be made of wood. As to the lower part, the back and sides are fixed on a frame of iron, ¾ of an inch broad, by means of rivets.

In the side view, eng. 1, the apparatus is represented as half-drawn back from the top of the stove, to show the manner in which it is hung and the arrangement of the pipes. The support A is a piece of three-quarter inch gas pipe, the upper end of which is kept in its place by screwing a plank to the ceiling in which is bored an auger-hole to receive that end of the pipe The lower extremity is made secure by piercing a hole in the stove plate, into which is screwed a piece of iron, bored to receive the butt-end of the pipe. If it be preferred, a piece of iron can be cast of the pattern shown in fig. 2, intended to fit the collar on the stove which holds the pipe, and to which it is fastened with a screw: the end of the pipe fitting into the hole B, eng. 2. The lower hinge, seen at B, fig. 1, and separately in fig. 3, is a piece of cast-iron, having at one of its extremities holes to receive the pipe A, fig. 1, and at the other a cross-piece on which is made a groove into which the lower edge of the hinder part of the apparatus is fitted. The length of this, from the centre of the holes to the centre of the groove, should be four inches, and the length of the cross-piece, six inches. Its height, taken from the middle of the holes, is from three inches to four inches, according to whether the pipe A is placed on the stove with or without the socket, fig. 2.

The upper hinge, see fig 4, is a simple piece of cast-iron screwed on to the top of the evaporator. The arrangement of the pipes, which allow the passage of the hot air from the evaporator into the stove-pipe, demands little explanation.

It need only be observed that the support A, passes through the centre of the vertical part, as shown by the dotted line fig. 1, which allows the elbows to form a moveable joint turning at the point C, where they meet. I use a seven-inch pipe above the connection with the evaporator, to facilitate the current of air. I place the lowest tray three inches from the bottom of the evaporator, which makes it seven inches from the stove; but observing that with a fierce fire there was some danger of burning the fruit, I place a piece of tin pierced with holes above the spot where the heat is the greatest fig. 5. This is kept in its place by hooks fastened to the iron frame which surrounds the lower part of the apparatus. The piece of tin is two feet long by one foot wide, with holes half an inch in diameter.

The frames will hold two bushels of sliced apples, or a like quantity of other fruit, If it is filled at night, the best time for this work, and a moderately dull fire is left in the stove, the fruit will be dry the next evening, even if the apparatus is drawn off the stove during the greater part of the day. The fruit dries rapidly even when it is not on the stove, a current of air passing continually through it. To blanch apples and other fruits that profit by the treatment, burn a little sulphur on the stove under the apparatus; the gas will pass through and amongst the fruit and blanch it perfectly when the frames are not too thickly laden. The sul-

Fig 2.

Fig 3

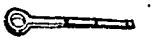


Fig 4.

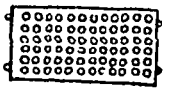


Fig 5

phurous gas and the smells from the drying fruit all pass into the chimney through the stove-pipe.

An evaporator of this size twice filled with fruit will suffice for the wants of an ordinary family for a year. It is easy to calculate the profits to be made by an industrious family willing to occupy the autumn and winter evenings in slicing apples. By keeping the apparatus at work, even to half its capacity, during three months, all the unsaleable apples grown in an ordinary year in an orchard of the size usually cultivated by farmers may be dried. I take what I have done myself as the basis of my calculation.

To the best of my knowledge, no part of the evaporator I have described has been patented. Ten dollars or less would make it. It cannot be used on a stove with a shelf at its upper part near the stove-pipe, or with a raised reservoir; but it might be arranged in such a manner as to be withdrawn from above the stove by means of pullies travelling on a horizontal bar of iron suspended from the ceiling. In the present engraving, it is seen placed on a kitchen-range, but a little beyond the centre, a common kitchen-stove with four holes will answer.

I hope that my explanations have been sufficiently clear to

enable an intelligent tinsmith, with the aid of the engravings, to construct the evaporator without much difficulty."

ELM.

Re translated from a French translation of the original article in the "[illegible]ral New Yorker."

This article [illegible]ublish in reply to a letter from Mr. Van Dyk, of Riga, [illegible]a, which we give above. We trust the small engraving will explain sufficiently the action of the elbows b & c, which appeared doubtful in the engravings published in that number of the French Journal to which Mr. Van Dyk refers in his letter. It seems that the *Journal of Agriculture* has penetrated even to the vast plains of Russia, (1) an honour we hardly dreamed of. We need hardly say that we shall be always happy to give any explanations that may be required to elucidate points in our pages that may appear obscure.

A. R. J. F

FERTILIZING FARM CROPS.

(*Continued from p.* 11.)

By James Cheesman, Montreal.

The gain and loss of soils under cultivation is almost a clear matter of arithmetic to the practitioner who has acquired an intimate acquaintance with his land. A Devonshire (England) farmer once said to me: "I don't care to keep my soil on one thing." He had been accustomed to use mineral super-phosphate, nitrate of soda, kainit, and dissolved bones, every year, in varying proportions for the different crops, and I had little trouble in persuading him to experiment with a ton or so of chemically prepared Peruvian guano at $70 per ton He was a sensible man; for it often happens that farmers accustomed to particular articles keep to those and those only, never changing. Every thoughtful man who has used commercial fertilizers must have been struck by the very soluble character of such articles as superphosphate of lime and nitrate of soda. Their great solubility renders them dangerous and risky, except in the hands of very cautious men. Much of the prejudice of old fashioned farmers against the use of chemicals has been too well founded, and the excessive rainfalls which Great Britain has recently experienced has been useful in teaching us this truth. For many years the farmers were much excited by the increased crops of hay and wheat, raised with the aid of nitrate of soda, and the enormous yields of roots grown on land fertilized with mineral super-phosphates. These crops were often diseased, and materially assisted in propagating the maladies which trouble wheat and roots. Examples of imperfect nutrition, in consequence of using in large quantities different kinds of incomplete fertilizers, are very numerous. One such, published by a manufacturing house, will help to illustrate what is meant:

FERTILIZER TEST IN SCOTLAND IN 1877.

Scotch turnips, sown 16th May and lifted 28th November; length of drill 130 yards, and 27 inches apart.

Fertilizer.	Lbs per acre 6,000 Sq yards	Cost per acre	Produce, lbs.
L. Diss'd Bones	1,589	$27 50	59 980
C " "	1,6 2	"	65,683
L Turnip Fertilizer	1,7 99	"	65,158
L Sol Bone "	1 449	"	65,527
G Am Fixed Guano	1.005	"	73.684
B Challenge	1,292	"	67,985
Super-phosphate	2,464	"	58,473
Mejillones Guano	1,493	"	54,342
Average			64,358

(1) ..." Supra Garamantas et Indos Proferet imperium!"

Of these eight samples four only were above the average. The Mejillones or high phosphoric guano, in the raw condition, was the worst, while the ammonia fixed guano, which sold at $61 per ton of 2,240 lbs, was shown to be the cheapest fertilizer of the series. This experiment was conducted by a man of large experience, whose only object was to find the most economical fertilizer in the market. The composition of the ammonia fixed guano was: Ammonia, 7 per cent.; phosphoric acid, 13 in the semi-soluble form of bicalcic phosphate, and 3.50 per cent. of potash and magnesia. The ammonia was present as sulphate, as were also the last named salts. The crop raised with this high class fertilizer was one of superior quality in its freedom from disease and its high specific gravity. One of the most useful lessons learned of late years has been the result of Prof. Church's work on the Specific Gravity of Roots. A few years ago that distinguished chemist read a paper before an audience of English agriculturists, in which the theory was advanced that the value of roots should always be guaged by their specific gravity. From a long series of well directed experiments, roots grown with imperfect fertilizers, such as acid phosphate, and especially that in the monocalcic form, were shown to possess an undue preponderance of water. Roots grown from seed of good stock, and with the aid of complete fertilizers, are well balanced in the distribution of their constituents. Prof. Tanner has also worked successfully in the same direction, and the results of his work are in perfect accord with those of Prof. Church's. Both agree in recommending the use of partially dissolved phosphate, and in combination with ingredients yielding ammonia, potash, sodic, and magnesian salts. Such is the condition of the trade in manufactured [illegible]rtilizers that every farmer can now buy what he wants, either in the sample state, or compounded according to some publicly acknowledged formula. John Bennet Lawes, Stockbridge, Mapes, and many others of a commercial character, are known to farmers The raw materials may also be purchased by those who prefer to compound for themselves. It is not generally advisable to do this, for obvious reasons. Unless the buyer has facilities for purchasing the articles he requires, and the requisite technical knowledge and farming experience to enable him to make a formula, he had better let it alone and seek the aid of a professional chemist, or go to a manufacturer and buy what he wants. There are special circumstances which make it desirable that the farmer should depart from the practice of some received formula, and desire one for his special use. It may be that the proportions will require to be varied to meet the wants of a soil of particular character. Sodic salts vary very much in different soils, and where some are specially poor in these a well prepared fertilizer, lacking soda, would have a poor chance of showing its best results.

Most farmers are aware that a simple acid phosphate does not do much for a root crop beyond increasing its bulk. But it very often exerts a most pernicious effect on the roots. To begin with—they are woody, hollow, and spongy; they will not keep, and, worst of all, they have a very low value as food. Roots make a great demand on the soil, not merely for phosphoric acid, but for potash, magnesia, soda, and lime, which, if absent, must necessarily indicate so serious a defect at harvest, and still more when the crop is fed to stock.

To aid those who prefer to compound for themselves, I offer the following approximate statement of the composition of the raw materials usually found in the market for the manufacture of chemical fertilizers:

ANIMAL PRODUCTS.

	Phosphoric Acid as Phosphate of Lime.	Nitrogen as Ammonia.	Alkaline Salts.
Raw Bones	37	4 50	1
Blood	2	15 to 17	
Fish Guano	11	6 " 9	
Peruvian Guano	12 to 35	5 " 13	1 to 5
Tankage	7 " 9	3 9	

MINERAL SALTS.

	Sulphate Potash.	Sulphate Magnesia	Chloride Magnesia	Chloride Potash	Chloride Sodium.
Kainit	23 to 28	12 to 14	11 to 13		30 to 33
Muriate Potash				95 to 97	
Sulphate Potash	89 to 94				

NITRIC ACID AND AMMONIACAL SALTS.

	Nitric Acid Ammonia	Sulphate Ammonia
Nitrate Potash	15 to 16	
Nitrate Soda	18 " 19	
Sulphate Ammonia		24 to 24 50

PHOSPHATIC SALTS.

	Phosphate of Lime.
South Carolina	50 to 60
Canadian Apatite	70 " 90
Norwegian Apatite	70 " 90
Bone Ash	65 " 75
German Phosphorite	60 " 75
Navassa Phosphate	45 " 57
Estramadura Phosphate	70 " 80
Bone Black	50 " 70

Before disposing of phosphates. it will be useful to append a short statement showing the solubility of raw phosphates, as determined by the experiment of Prof. C. P. Williams of England:

	Parts of water.
Phosphate as Apatite, finely ground, soluble in	140.840
" Bone ash " "	5.678
" South Carolina "	4.122
" Orchilla Guano "	8.009

Armed with a knowledge of the approximate composition of his raw materials, any farmer may go to work and make his own compounds. but in doing so due regard must always be paid to the physical character of the raw materials. To explain what is meant: Every one knows that raw bones are better than steamed, but there are conditions of raw and steamed bone which the consumer is sometimes slow to discover. A bone may be rich in organic matter, and yield nitrogen 4.75, and more of ammonia, and it may also be a very greasy sample Rich bone has been found in the soil, years after its application, a nest of maggots, and such is a frequent result of using material containing grease. Bones should always be well boiled for their grease, but not necessarily under pressure. When pressure is used, much of the gelatine is extracted for the purpose of glue making, and therefore there is less of nitrogen, but the phosphate is improved, in as much as biphosphate of lime is formed, and the action is similar to that of guano phosphate.

I shall not prejudice this article by prescribing any new formula, as there are so many useful ones in the market already. But to use any one of them to advantage, experience, judgment and skill are necessary to insure good results. Manufactured fertilizers in the hand of the wrong person are about as fatal to good crops as a set of surgical instruments would be in the hand of an incompetent practitioner. The United States, although a youthful country, cannot afford to despise the smallest economy, and they accomplish most who teach and practice the smallest savings. The profligacy one meets with out West is of small consequence in its direct results, but it is of infinite importance that the rising generation, and especially the young children, should not know waste. It is a matter of as much moment to the state that the farmers of Nebraska, Kansas and Minnesota should husband every source of fertility as that their brothers of New York and Georgia should exercise caution in buying commercial fertilizers. There is a waste in unscientific cropping, and an immense economy in skilful farming. The enormous growth of the trade in fertilizers during the last few years, although gratifying as illustrating progress in agriculture, brings also its note of warning.

A Liverpool friend gave me some figures indicating the condition of trade two years ago. They are as follows: "In January, 1880, price of Charleston phosphate was, in Liverpool, 19c. per unit or per cent. of phosphate; Canadian phosphate, 20 c In January, 1881, prices were: Charleston, 21c. and 24c., and Canadian 28 to 30c. January, 1882, Canadian was 33 to 37c.

"Five or six years ago the manufacture in the United States was about 150,000 tons; in 1881 the product was one million.

Exports of rock from South Carolina to England from 1st

Sept., 1879, to 31st Aug., 1881	51,573 tons.
From Sept 1st. 1878, to Aug. 31st, 1879	109 948 "
Showing a decrease of	58,375

Shipments of rock from S. Carolina to U. S. ports from Sept.

1st, 1879,to Aug. 31st, 1883	112.940 tons.
From Sept. 1st, 1878, to Aug. 31st, 1879	79,936 "
An increase of	33,004

With such a rapid increase in the trade, accompanied with as constant an increase of value, there is every reason to believe that prices must go on advancing with the increase in the value of land. Farmers in the East and South-East have commenced a protest against extensive areas by a system of more intensive farming Experience is teaching them that there is economy in thoroughness of work, that it is better if wheat must be grown to take 1,000 bushels from 40 acres than farm 100 acres for the same amount. The difference between 25 and 10 bushels is the same as that between an animal matured at 4 years old and one put into market at 30 months. The law of nutrition is concerned in both cases. If the soil can be said to have a physiology (in a limited sense it has) then the conditions of secretion in soil plant, and animal, are the same. It is a question of growth and development, and to succeed in either we must know the conditions. To know them and understand them with the simplicity and familiarity born of a close companionship we must experiment, not watch the effects produced at the stations, but test for ourselves, and occasionally, when qualified to formulate intelligent plans, make original tests. Mere blind empiricism is not for a moment to be encouraged, but well directed efforts will bring their own reward. The only conditions exacted of us are faithful observation, obedient conformity to established science, and if such work be carefully reported it cannot fail to serve the economy and progress of American agriculture.

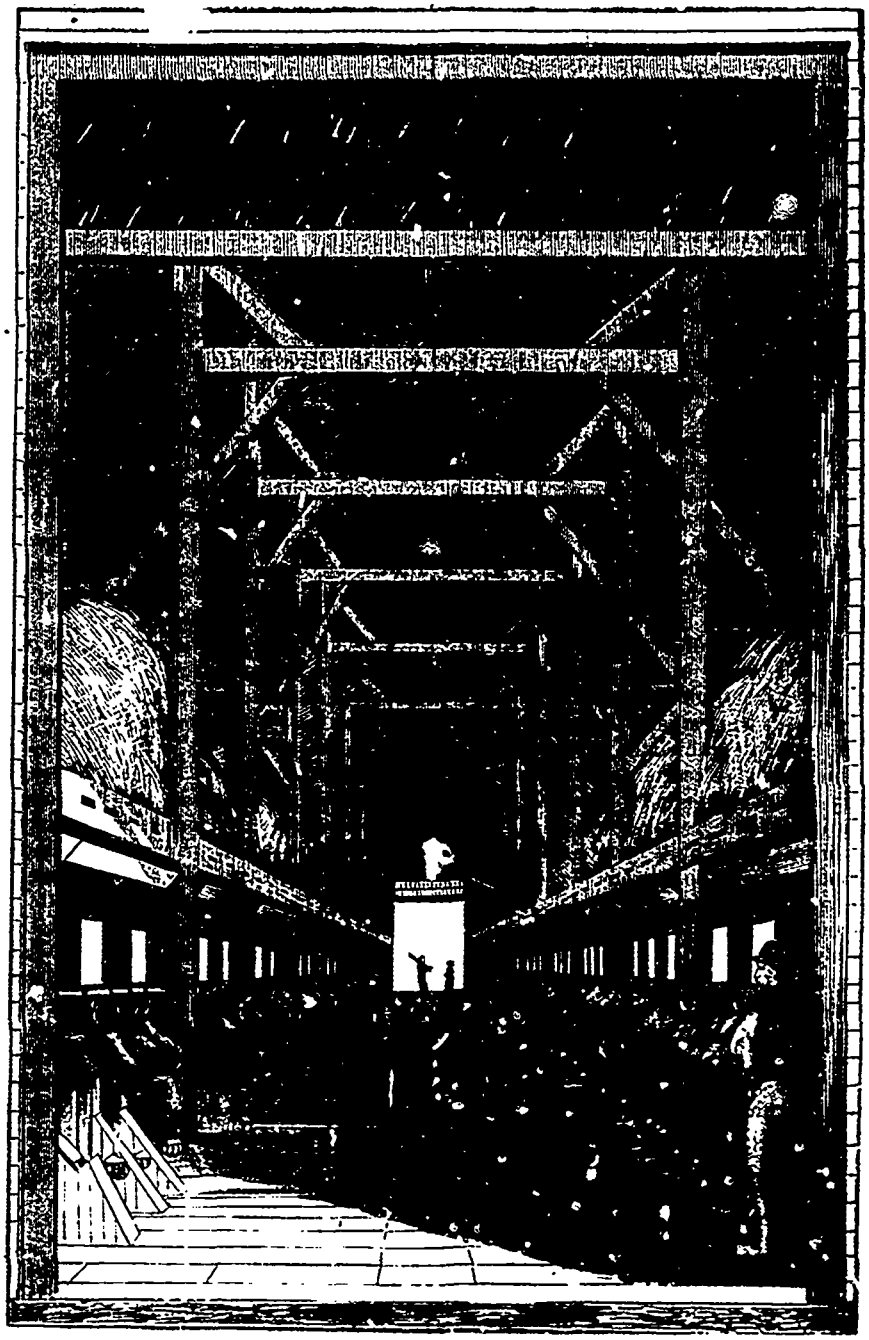
POULTRY DEPARTMENT.

Management of Young Chicks.

EDS. COUNTRY GENTLEMAN—In the rearing of chicks, particularly early ones, the hen must be confined during the pleasant portion of the day, so that the chicks may have the advantage of running and scratching in the open air. This is an important means to success. In former years I used coops to keep the hens confined, but finally gave them up. During the day, when the hen was confined and the chicks abroad, there was a constant struggle on her part to get out. She was restless and impatient, and as in all broods, there are some little ones more delicate than the others, these require the tender nursing and brooding of the hen. Her attention is directed toward the smart ones, and her whole desire is to be abroad with them, consequently the puny ones suffer.

Early broods need protection, and must be housed in buildings at night. Of late years I have tied the hen in a warm, sunny locality, on pleasant days. I give her a string about a yard long, fastening it securely to a pin, post or tree, close to the ground. I use a piece of soft "list" about half an inch in width. I make a noose in the end, and slip the hen's leg through it. The harder the fowl pulls, the tighter the loop, but being soft and broad, does no injury. When first commencing this operation, I place the chicks all safely in a basket, and cover with a blanket, so that they may not escape, and I then allow the hen to try her best to escape. At first a hen that is new to the business will fly, tug at the string, and use her beak to loosen it; but the more furious her trials to escape, the sooner she gives up and submits. My fowls are gentle and accustomed to being handled, and are not easily frightened on my approach.

When sobered down, I place some food before her, and give her the chicks. Then she is delighted, and clucks and calls them up to her. As the garden is contiguous, I anchor her in one corner where she can do no damage by scratching, and be under supervision if any accident occur. She soon becomes accustomed to the business, and becomes quiet. She has plenty of loose earth, and scratches it over day after day, while the little ones run among the early vegetables, and gather many insects and worms, doing no harm whatever. I keep her in this one place until the chicks are weaned, which will be in the course of three or four weeks, according to the age of the hen, and the quantity of food allowed her. A young hen will wean her chicks soonest, often too early for their good.



MR HAVEMEYER'S CATTLE BARN.

After the chicks are weaned, the hen is put into the yard with the layers, and the chicks keep on in their old runs, the tethering post being their feeding place. In this manner they miss the mother very little, and do not pine at all.

My method, perhaps, is a little different from that of the majority, but it is simple and well adapted to my conveniences and purposes. All may not understand that fowls should early be trained in the ways they are to go. I do not put my chicks out, when young and the season is chilly, until the sun is well up, say about eight, nine, or ten o'clock, according to the warmth of the weather and age of chicks. I

have a building for the purpose of housing the chicks at night. When young, they go in at 2 P. M., are fed and put to roost in the basket, and covered. At 4 P. M. they are fed again and put to roost for the night. C. B. *Duchess Co., N. Y.*

Let them Scratch their own Grain.

EDS COUNTRY GENTLEMAN—Your thoughtful correspondent, H. STEWART, on page 1021, last volume, has undoubtedly made a departure from the usual practice of confining fowls in quarters so small that they can neither gather their food in a cleanly condition nor take the exercise naturally required to keep them in a normally healthy state. We are told by veterinary writers, that the infection called cholera is conveyed by fungous germs found in fowl droppings. Many poultry yards, or rather pens, are contaminated with poultry dung, and the fowls are compelled to eat filth with their food.

Hogs and poultry are not naturally filthy when they can choose clean places in which to rest or eat, their instinct being sufficient to distinguish conditions that are comfortable. Mr. Stewart's suggestion of half-acre pastures is in the right direction, as enlarging their yards secures cleaner feeding space, whether the food be herbage or scattered grains. Half an acre of land cannot supply 100 fowls space enough for half as much exercise as they would naturally take if not inclosed, hence it is clear that however well the feeding might be, the plan does not go far enough in securing the sanitary benefits of a natural degree of exercise, even if 100 fowls could exercise for one or two months on half an acre of rye without making it dirty and unwholesome. Moreover, setting off an acre of land is not generally practicable for poultry raisers.

While then, Mr. Stewart's suggestions, particularly in the matter of ploughing the ground on which the fowls are to feed, are good in kind, I think his plan can be amended so as to produce better sanitary effects and be more generally practicable on a smaller quantity of land.

Suppose a poultry house to be built in the centre of half an acre of land, the land being 15 to 20 rods long by 5 or 4 rods in width. Each end can be fenced separately, with an entrance door to the poultry house for each lot. These lots can be used alternately, one being in use while the seed in the others is germinating or getting ready for the fowls Calculate how much wheat, rye, corn, and barley, mixed, will supply them with 2 or 3 week's rations, and then sow by hand, and plow in that quantity of mixed grain, covering it 1 or 1½ inches deep. Or it may be drilled as most convenient This mixture of grain will be fit to turn the fowls into when the sprouts average half an inch in length. Scratching is the natural way for fowls to search for and obtain their animal food, and undoubtedly this sort of exercise tends to strengthen them, hence scratching the sprouted grain out of the ground is at once a natural and beneficial way to supply fowls with exercise, and food in a condition that is much relished by the birds. Turning the fowls in as soon as three fourths of the planted grain is sprouted, would be most economical, when it is desired to economize feed and obtain the sanitary influence of oxygen on the soil of the feeding ground, by frequently exposing it to the air. In a dry time the germination of the mixed grain might take more time, but it would afford more food when ready, if planted deeper to reach moisture enough to insure its germination.

By the above method, two feed lots are planted with mixed grain and worked over by the scratching fowls, alternately, from early spring till late fall, one lot being sown with rye just before freezing up at the commencement of winter. Early in spring the other lot may be planted with spring rye and Canada or other field peas, mixed, on fall-ploughed ground, as soon as the frost is out two inches deep. The fowls get both animal and vegetable food in a natural condition, procuring it in the most healthy and natural way throughout the growing season of the year. By the fowls' breathing twice as much when scratching as they do when roosting, or when still, the blood is better purified; hence, the most active fowls are always the most healthy. This plan, therefore, appears to be economical, practical, simple, healthful, and best adapted to the general circumstances of most poultry keepers, as well as tending strongly to achieve the great object of preventing disease among the fowls. J. W. CLARKE.

Plymouth County, Iowa.

Simple and Successful Feeding

EDS. COUNTRY GENTLEMAN—I have read with much interest the various disputations about feeding poultry, which have from time to time appeared in your columns. I do not care to enter the arena at all, but a brief allusion to my experience may suggest thought, if nothing more. I have tried pretty nearly every method of feeding which has ever come to my notice, and have finally adopted one of my own, which I believe is more in accordance with the physiology and habits of fowls than any other which is practicable, and it has afforded me more satisfaction, with less labor and expense than any other. Little at a time and often, is the theory on which my practice is based.

My staple feed, supplied *ad libitum*, is fine, dry, ground feed, the largest part of which is wheat middlings, shorts or bran. All sorts of grain, and cotton-seed-meal, in small proportions, are sometimes used. Cornmeal, in the proportion of one to two of the shipstuffs, is as satisfactory to the fowls as any other of my mixtures, and I have had less disease, more growth, more eggs, perhaps less fat, but enough nevertheless; less annoyance from the raids of the fowls upon outside commodities, whether in field or yard, and less trouble generally since I entered upon its use for old fowls and young, than even before. The mother hen gets something which she can pick up and feed to her young brood till they learn to pick up their own food, after which they are fed in the same way as the grown fowls. Of course they all get many tidbits in the course of the year, but I allude here to the regular every-day feed. I had a hen last summer which was given the broods of two other hens at a week old, and she raised the 37 chicks without loss or accident. They sometimes got a baked potato, a bit of curd, a handful of wheat screenings, a few nubbins of corn, or something else to tame them, but the bulk of their food was as above.

My fowls are given fresh, clean water twice a day. The pail is kept full, so that if a chick gets in it can get out. Little and big drink at the same pail A pan of milk is often given them, though I think less of it for the purpose than many do. I set a weighted pail, or can, into the pan to keep the fowls out and let them drink what they will, but the mixing of hodge-peddings is all a thing of the past. Except a few kitchen scraps, occasionally a beet, turnip, or cabbage, my fowls are fed but once a day. In cold weather, their boxes are replenished in the afternoon, so that they may go to roost with full crops. In warm weather the food is given them after they go to roost, so that they may not have any temptation to start out in the morning on marauding expeditions. They are generally kept in confinement in cold weather, and sometimes in warm weather, but not generally. O. S. BLISS.

Farmers' Experiments with Fertilizers.

BY DR HOSKINS.

Experience has shown us that it is very difficult to make successful and really conclusive experiments with artificial fertilizers upon regular farm crops Such experiments require so much care, and so much extra work, and, withal, so much preliminary knowledge of various kinds in connection with the preparation of the land, the selection and planting of the seed, and the equal care of the crop through the whole season, and the results are so likely to be vitiated by the season, or by other things beyond our control, that very little dependence can be placed upon the apparent result, especially when, as is usually the case, the difference between one fertilizer and another is seemingly small.

These experiments will be difficult enough and unsatisfactory enough in the majority of cases, even where one fertilizer is compared with another, or with no fertilizer, in a field where no other manure has been applied, and wich is supposed to be very even in its condition. But how many of us have farms on which we can select even a single acre that is uniform in its natural and acquired condition ? The effect of some fertilizers, such as lime, ashes, or even stable manure in extra quantity or of extra quality, lasts for years. The hollows and runs, even if very shallow or small, are sure to be richer than the land around them. One part of a piece, even a small one, may be much more weedy than another. The sub soil may be different. Every one of these things will affect the result, and yet when we come to weigh and measure the crop, having treated it with perhaps four or five different brands of commercial fertilizers, the difference between them may be only at the rate of four or five bushels of corn, or ten or twelve bushels of potatoes, to the acre, and this on a small strip in which more than these differences may have been made even in the measurement of the ground, to say nothing of possible differences named above, or the difference in the hoeing of two or three persons who may have worked at the piece during the season. This alone would knock any experiment on the head,so far as learning anything from it is concerned, for we all know that the difference between one man's hoeing and what another will *call* hoeing is likely to show in the crop far more than the probable difference between Bradley's and Bowker's, or the Quinnipiac and the Pacific guano.

Even if all these things were just right, and we could control the weather and keep our own and our neighbours' cattle out of our experimental plots, there is but one man in a good many who knows how very careful he must be not to give one lot an unconscious or careless advantage over another. If ten different men or boys drop the fertilizer, the way they do it may be different enough to give a large difference in the crop on that account alone.. One will throw it in large or small spoonfuls, indifferently, and all in a heap in the middle of the hill, and get done quick, and be called smart. Another will carefully scatter an even and equal measure of it on the dirt to be used for covering the seed, and be longer, and get compared to the other at a disadvantage. No fair comparison can be made in this way. When the land is measured, it may be (and usually is) merely paced off, or the rows counted with no careful allowance for missing hills, or the effect of replanting. These are but a few of the ways in which an inexact experimenter will spoil his experiment.

Still again, he may put fertilizers of very different composition against one another in such a way that the result, whatever it may be, will not give any correct information. It is perfectly fair (if everything else about the trial is fair) to put one complete fertilizer against another complete fertilizer, or against no fertilizer, to see the difference between the two. Take any of the general fertilizers now sold in this State under our fertilizer law, which all contain a fair proportion of the three essential fertilizing constituents, phosphoric acid, combined nitrogen, and potash, and test them against each other, or against the land without any fertilizer, and it would be a fair test; though in all probability there would be no difference in the crop fairly attributable to the fertilizers, because the makers now make substantially the same thing, the differences, if any, being too small to show in an ordinary crop, as ordinarily managed.

It would also be fair to test these fertilizers, or any one of them, against an equal or proportional value of good average stable manure, for the purpose of ascertaining how much of the one is equal in results to the other. This is one of the easiest experiments, and most instructive, if carefully carried out, that an ordinary farmer can try. The result will be different on different crops, for on some the fertilizer will seem to be the cheaper, and on others the manure will far outdo the fertilizer. To find out just how and on what sort of land, and with what kind of crops these differences are found, is both interesting and informing.

But there are a number of excellent fertilizing substances, extremely valuable when understandingly used, that cannot be fairly tested alone against any complete fertilizer or manure. Take ashes, plaster, lime, uncomposted swamp muck, ground South Carolina phosphate rock, or even a plain acid phosphate, such as was recommended by Dr. Cutting in his lectures last winter. You cannot test any of these fairly against manure or complete fertilizers, because, though very valuable when properly used, they do not contain all the elements of fertility, and most of our worn-out soils, especially if light, require them all to produce a crop. Take for instance a fertilizer without potash, like Dr. Cutting's, made with raw bone and sulphuric acid alone, and try it against Bradley's, Bowker's, Quinnipiac, or Pacific Guano, on a light piece of land, hungry for potash. It will often appear to be no better than nothing at all. The rows where it is applied will be greatly inferior, and, not knowing the reason, many will say, "Dr. Cutting is a humbug." But make the trial on strong clay soil, and Dr. Cutting's fertillizer will do as well as Bradley's, and the farmer will say, "Dr. Cutting is the right man for secretary of our Board of Agriculture." The fertilizer is the same in both cases, but the available natural potash had been taken out of the sandy soil by previous crops, while the clay soil still retained enough potash to go with the phosphoric acid and combined nitrogen of the raw bone used in Dr. Cutting's fertilizer and make it complete for that land. On such soils the application of potash is unnecessary But the fertilizer makers know that the most of their fertilizer is going to be used on land that is deficient in potash, and so they now all put in some of the German potash salts to meet this demand.

This is one of the reasons why we think the preparation of ground bone and ashes which we use is better than Dr. Cutting's ground bone and sulphuric acid. Ours is a complete fertilizer, while Dr. Cutting's is not. But that is not the only reason. Every Vermont farmer has the ashes, or can easily get them. They are not going to cost as much as the acid, and are themselves valuable, and generally necessary, as a part of the fertilizer, while the acid is not, being used merely to decompose the bones, which the ashes, when wet, will do equally well. And not less important is the fact that sulphuric acid is very dangerous stuff to handle. A single drop spattered into the eye will destroy it, and it is very sure to spatter. (1) It will also make a hole through clothing as quick as fire, and will make bad sores where it

(1) Sulphuric acid should always be drawn from the carboy with a syphon. A. R. J. F.

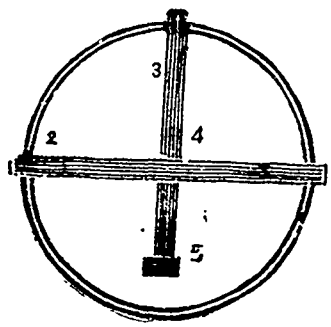
comes in contact with the flesh. It is also liable to be left around in bottles and pitchers, and to be swallowed by somebody thinking it to be water, or perhaps liquor A single swallow is pretty sure death, not because it is poison, but because it is corrosive and destructive to the flesh. Diluted with water until it is a pleasant sour, and swallowed, sulphuric acid is a pleasant and harmless drink. But in its concentrated form it is about as safe to drink as melted lead.

There is nothing we can get that is better worth what it costs as a manure than ashes, but it is not a complete fertilizer, and on soils that are cold, wet, or "worn out," ashes seem to do no good. They want some form of nitrogenous manure, and perhaps some phosphoric acid, though ashes contain some of that naturally, and when liberally applied will furnish a plenty for one or two crops. But their phosphoric acid is small in proportion to their potash On strong clay land, and on some rich slaty or "marly" gravels, ashes do no good because there is natural potash enough in the soil. Raw ground bone contains both phosphoric acid and combined nitrogen, and when mixed with ashes the compound is a complete fertilizer. But raw ground bone contains a good deal of grease, which keeps out the water and prevents its decomposition in the soil. To cure this defect we mix the ground bone with the ashes (two or three barrels of ashes to one of bone), and pack the mixture firmly into barrels, making holes nearly to the bottom with a broom-stick or hoe-handle, and pouring in enough water to soak the mixture without making it leach. This dissolves all the grease, and also "cuts" or softens the nitrogenous animal matter of the bone, so that it is all ready for the plants to use. All can see that this is a simpler, more easily and safely made, and more complete fertilizer than one made with bone and acid. If three barrels of ashes are used to one of bone, it is well to keep one until the rest of the ashes mixed with the bone has taken effect (one, two or three weeks, according as you have time to wait, but the longer the better). Before applying it to the land, turn out the mixture in the barrels, and with a shovel mix the reserved dry ashes with it. This makes it better to handle, and easier to spread. Use this mixture just as you would a purchased fertilizer, but in double the quantity.

We said above that sulphuric acid was of no use as a fertilizer. This is true, yet it is of some use in the soil for its chemical action, especially in setting potash free from its insoluble (in water) combinations with other minerals. But we can buy sulphuric acid in a much cheaper and safer form, if we buy it in land plaster, which is merely sulphuric acid and lime combined together. We have used a great deal of plaster as a fertilizer, and have made up our mind that its value is due to the sulphuric acid in it. The quantity of lime in it is so small that it does not seem possible that the lime should have any part in the effect, for there is no soil that we cultivate that does not naturally contain far more lime than we ever apply in a dressing of plaster. It is universally agreed that the crop plaster does the most good to is clover, and especially red clover Red clover is a very independent plant for such a strong grower. It is so, because it sends its roots deep and wide, and these roots seem to have a power to find the nitrogen compounds, and separate them from the soil, and use them, such as hardly any other plant has. Clover don't ask for nitrogen in a fertilizer. But it does seem to want plaster, and to make great use of it. We think it uses the sulphuric acid in the plaster in some way to get hold of the potash (and perhaps also the nitrogen) in the soil, and thus feeds itself, if it can only have this little digestive to work with. Anyway, plaster does wonders for clover. It seems often to have a similar, though less marked, effect on corn and potatoes. For this reason we do not reckon the plaster which constitues about one-half of our best commercial fertilizers (not added, but made by the union of the sulphuric acid with the lime of the bones) as being of no value, as is the custom of chemists in making their analyses. We think the plaster in a barrel of good phosphate is worth as much as though it were bought separately, and there are from one hundred to one hundred and fifty pounds in each barrel. Taking the analysis on one of Bradley's barrels, we find that only one-fourth of the whole weight consists of phosphate of lime, nitrogen compounds, and potash. Most of the remainder is plaster. But plaster alone on any tilled crop is not very effective, and cannot be depended upon to make a fair yield. It is useful, but must have the other elements of fertility along with it to give us a crop.

A RAT TRAP.

Take a barrel that will hold water; cut a notch on edge of barrel on opposite side after one head is taken out; then take a strip to reach across the barrel to fit in notches; make round each end so it will turn easily; then take a second piece to go across the barrel flat; allow one end to rest on the edge of the barrel; tack in middle of the first strip, bait by tacking a meat skin on this short end; fill barrel with water, and often one-half bushel rats can be caught in a single night.



The above diagram shows the outline of the trap. 1 notches; 2 first strip; 3 second strip; 4 nail in center; 5 bait of meat skin. "This," writes Dr. Folk, "is a self setting trap, and the best, I believe in the world." Any intelligent reader of the Journal, ought to be able to make, or plan for some one else to do the work, a trap of this kind to put in a corn-house, cellar or other places infested by rats.

Mr Jenner Fust, has been appointed Professor of Agriculture at Lincoln College, Sorel. There is a farm of 160 acres attached to the College, which will be added to as opportunities occur. Lectures will be given by the Professor on the theory and practice of agriculture, and the cultivation of the farm, the management of the stock, etc., will be entirely under his control. Mr Jenner Fust will still continue his connection with the *Journal of Agriculture*. Lincoln College is fortunate in securing the services of so competent a man as Professor Jenner Fust.—*Montreal Star*.

OUR ENGRAVINGS.

Havemeyer's Cattle Barn.

Garfield's American hay-tedder working with the back action.

Shorthorn bull, Fourth Duke of Clarence: the property of the Bow Park Farm stock association.

Racine Sulky plough.

Fruit-evaporator illustrated.

The Farmer's Cow.

R. GOODMAN.

THE line is being sharply drawn between those who argue that a new breed can be originated by a judicious cross-breeding among the existing races and cows be produced combining the beef qualities of one and the dairy qualities of others; and those who claim that the true course is to con-

tinue in the line pursued on the other side of the water and improve the breeds already existing. Cattle breeding as a science is comparatively a novelty in this country and naturally in its infancy there will be discordant views among those engaging in it practically and those theoretically sounding the trumpets from the watch towers. When the late illustrious naturalist Darwin, to whose studies and experiments farmers, and especially breeders, are with others so much indebted, published his pioneer essay in his great work, "The Origin of Species," the element in it that met the strongest opposition was, not the assumption that all organic forms have been evolved from one or more primordial germs, or that this had been effected by natural selection, but that such natural selection was without design and conducted by unintelligent physical causes, and, however true this disputed point may be as to early creations, we know, not only from the history of all the leading breeds of cattle which are of record, but from the books of Mr. Darwin himself, that the present condition of the most highly esteemed beef and dairy animals is owing to judicious selection and intelligent scientific breeding.

This science was but a swaddled infant when our ancestors settled in the wilderness of America, and even if they had been familiar with it, their conditions and surroundings were such that compliance with its requisitions would have been impracticable, even if judicious. The segregation of employments, even then existing in the older-settled countries, could not at once be established here, and as the attorney and barrister were united in one person, the barber and surgeon in another, and the apothecary and doctor were one and the same individual, so,the farmer was the agriculturist, the butcher, the milkman, and often the shoemaker and carpenter combined, and the cattle that he needed, were of a like composite nature carrying beef and producing milk, butter, veal, and leather, for the use of the community generally. Now, as we have progressed in civilization, population, and wealth, we are approximating in all these and other employments and conditions to our elder brethren across the water, and the farmer's cows are different in their requirements from their predecessors. With the exception of the Devons, none of the original introductions from the various counties and districts of Great Britain, from Holland, Sweden,and other Continental regions,were preserved in their purity by the colonists, and our "native" cattle are derived from all these importations graded up again occasionally, by the introduction of pure-bred English bulls, usually Durhams.

Now we have come to the "parting of the ways," and the question is mooted whether the farmer had better, according to his business of beef raiser or dairyman, select from one of the established breeds and continue the improvement of that, or attempt from a combination of these to raise a new variety better adapted to his special needs. There have been one or two almost successful efforts in this country to establish an independent milking species from our domestic varieties, but in all probability the principle of *heredity*, and that form of it termed *atavism*, interfered with the continuance of the experiment. There are so many conditions inseparable from breeding under the most intelligent and scientific manipulation, that an ordinary farmer will hesitate before making the attempt—the time required; the prepotency of a single animal—as in the case of the famous Shorthorn bull Favorite—of one race over another, as in the case of the Shorthorns generally; the results of selection from the same stock by different breeders—the sheep of Buckley and Burgess, from the original flock of Bakewell, differing so as to appear of different varieties – and the various conditions of soil, climate, extent and character of country.

Heavy breeds of cattle could not be formed or improved on mountainous pastures—the cattle of the small islands of Jersey, Guernsey and Alderney could not have come to their present merits as butter-producers with the same rapidity in a widely extended country, nor could the wool of sheep have been so increased in length within the tropics, nor the varieties of round bodied, short-snouted pigs have attained their rotundity and early-fattening qualities if allowed to roam as in Homer's day, searching for their own provender; though they would be thereby more healthy as food for us. We have in this country, with its diverse characters of soil and various temperatures, as good conditions for the experiment of improving the present, or creating a new species of useful cow for the shambles or dairy as can exist, and perhaps the easiest way for the enterprising and intelligent farmer is to select from such one of the improved breeds as is adapted to his purpose as perfect specimens as he can afford to obtain, and improve them, instead of starting *de novo*, and running the risk of all the obstacles interfering with his progress which have already been met and eliminated. The butter-maker can hardly expect in his generation to raise up a cow which will exceed in production seven to eight hundred pounds per annum; the beef producer to improve the improved Durham or Hereford; and the ordinary farmer can get satisfactory results by the crossing of our best "native" cows with the Jersey, Ayrshire or Shorthorn bulls, according to the needs of his family or business for butter, milk or beef.

Lenox, Mass.

The Agricultural Press.

About a hundred years ago, Arthur Young conducted a pioneer agricultural gazette in England, and gave the first great impulse which has gradually rendered the farm practice of Great Britain a pattern for all countries, and made the farmers,and (more slowly) their laborers, intelligent men. General Washington was then a farmer, and his correspondence with Arthur Young is the matter of a very interesting boook. But Mr. Young was sneered at at home, because he was not himself a successful farmer—probably because his time was absorbed in travel, interview, and constant work at the desk. The foot of the owner is well said to be the best manure for the farm; and certainly a farmer who cannot be out all the time, to note the doings of all his hands and the condition of all his flocks, and to make shifts and changes as the variations of the weather render them needful, cannot keep his farm up to the highest mark of neatness and profitableness.

This subject reminds the writer of a remark once made by a veteran American culturist and writer, Suel Foster of Iowa, who was one of the earliest, most faithful and sagacious advocates of special agricultural schools, and to whose efforts the State of Iowa (not the farm fraternity alone) is largely indebted for the excellent service rendered by the college at Ames. A little before the outbreak of the rebellion, when the Pennsylvania State College was newly instituted, Mr. Foster came east to visit it, and as it was just then a question whether it should be entitled "Model Farm," in addition to its original name of Farmers' High School, he remarked that a farm intended for experiment, and to be largely worked by students, could not possibly be at the same time a model farm, as the practice must necessarily differ greatly from that of a regular business farm. Experience proved the correctness of this view, and the remark would apply to the operations of almost any weekly writer for agricultural papers, who must base his opinions necessarily on prior experience and current observation, rather than on tests which his other duties debar him from making himself.

Modern agricultural papers do not depend upon their edi-

tors for much more than wise discrimination. They are vehicles for the expression of the opinions of their readers, who are in one sense a club, and who are every year more and more able and ready to take part in the written discussions. As another has said "The isolated farmer needs this means of association with others, and his ideas are sharpened and cleared by joining in the discussions. I can say for myself that I have rid myself of much error by the investigations which I have been induceed to make before venturing an opinion into print. And my practice has been much modified through joining in such correspondence." (1) W. G. W.

Why Eggs do not Hatch

EDS. COUNTRY GENTLEMAN.—I am an advocate of early chickens; they escape many diseases that are ruinous to the midsummer flocks Still there is such a thing as getting them out of the shell too soon to be advantageous. There is often some difficulty in hatching early eggs, which is not experienced later in the season; yet as a general thing the early eggs hatch best with me, as they are better fertilized. The fowls are fresh and more vigorous. One difficulty with the non hatching eggs is placing too many under one hen, when fewer eggs should be used early in the season. Another trouble with the early eggs is the lack of strength in the shell, and many are broken. Under the hen they never last long enough to become even addled, while in an incubator they might hatch.

Hens that are to produce the eggs for hatching purposes should be separated from the flock and fed differently This must be done quite early in the season, so that the fowls may become domesticated in their quarters before producing the eggs This is necessary, because any change or removal of laying hens hinders the production of eggs. If in full laying, it will almost entirely break them up, and it will be some time before they commence again. This has been my experience. Avoid overfeeding as much as possible. They should have good food and plenty of it, which gives vigor to the egg and strength to the shell.

In choosing breeding fowls, care should be taken to discard all which manifest any weakness, choosing only those that are strong and healthy. If the broods had been much afflicted with the gapes the year before, it is well to reject any known to have survived the attack, although they may not show any signs of debility whatever. Not that it is hereditary, or that the distemper is catching. I hold that any fowl is weak which shows all the signs and symptoms of the gapes, although with careful nursing and surgical operation they may withstand the disorder and survive. The vigor is impaired, and there remains only sufficient for the fowl itself, and none to impart to the offspring. Early eggs are apt to become chilled when first set. This is another cause of failure to hatch. The first ten days is the most critical period of incubation. Later than this, the shell becomes tougher and harder, the inner skin thickens and protects the rapidly increasing embryo, which at this stage begins to show life.

It is often the case that full grown chicks do not break from the shell, although the chick is strong in the unchipped shell and cries lustily However, it dies in the shell the following day. This is frequently the case with eggs from old hens. I have attributed the cause of this to too much heat and a lack of moisture. At the start, the shell of the egg is thick and strong, and the increased strength that is added from incubation makes a wall so strong that it resists all the efforts of the young chick. These eggs should be set on the ground. C. B.

Duchess Co., N. Y.

(1) The last paragraph is worthy of my readers' attention A. R J. F.