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MANURES.

MINERAL SALTS OR MANURES.

(Continued from page 149)

Having thus considered the salts derived from the animal, let us now proceed to those derived from the mineral kingdom. Among these we shall find some whose action is similar to that of the animal salts. That is, they are true nourishers of plants.

They afford, by the action of the growing plant, the same elements as the animal salts. Of this nature is saltpetre. Now, reader, I want you to understand by saltpetre, not only that well-known substance, but also that which has lately been much used in farming, South American saltpetre. This differs from common saltpetre, by changing its potash for soda. One step more, I want you to understand by saltpetre, not one salt, but, in farming, a class of salts; that is, a number having the same acid, which may be combined with several different bases which all act one way. Saltpetre, being a salt, of course, must be composed of an acid and a base. The acid is always aqua-fortis, or nitric acid. The base may be potash, or soda, or lime, or ammonia. These all may be called saltpetre. In forming saltpetre, it is generally that variety which contains lime and aqua-fortis which is procured. So far as we understand the action of salts, and this has been fully explained, the action of the varieties of saltpetre is the same; and were it not for the peculiar nature of the aqua-fortis, or acid of saltpetre, the explanation of the action of this salt might be referred to the general laws above set forth. But the acid of saltpetre is composed of volatile ingredients. It is nothing more or less than a compound of the common air we breathe. Surprising as it may seem, reader, yet it is not the less true, the common air is a mixture of oxygen and nitrogen. What a bland and harmless, yea, what a healthful blessing is air, not only to us, but to plants! It is a mere mixture, not a chemical compound, a mere mixture. In every hundred parts, eighty of nitrogen, twenty of oxygen. Yet if you compel, as natural operations are continually compelling the air to unite chemically, so that fourteen parts of nitrogen shall unite to forty parts of oxygen you will form aqua-fortis. Now, I do not mean to trouble your head further with the chemistry of saltpetre, than merely to say, that having thus shown you the composition and origin of the acid of all kinds of saltpetre, you will readily see, that a substance which affords such an abundance of nitrogen, cannot but be beneficial to plants. This nitrogen may, and probably does, form some portion of ammonia in the soil. It may enter as nitrogen into the plants, dissolved in water, as a very weak aqua-fortis.

We have said so much upon the action of ammonia and nitrogen, that you will perceive how important a part nitre is likely to play in manure. Not only does the nitrogen act here, but the oxygen, the other component of the acid, also acts. It acts upon the mould as air itself would. Besides, the mould of soil and manure imbibes and condenses this oxygen in its pores, and consequently heats a little; so that saltpetre, whether added as such to soil, or formed in manure, as it is always helps to warm a little the soil, like fermenting manure. So far as these effects are desirable they may be expected from the use of saltpetre. But this, reader, if you buy your saltpetre, is procuring a small effect at a great price. The action of the alkali of saltpetre is not different from alkali in other shapes, and therefore if you have money to lay out for salts, let me advise you reader, to spend it rather for ashes than for saltpetre.

OF ARTIFICIAL NITRE BEDS.

But there is a fashion in manures as well as in other things, and saltpetre is now so fashionable that you may be inclined to use it. Be it so. I will show you, reader, how to make it for yourself, and at the same time form a large pile of capital mould. But as you have begun to inquire a little into the reason of things, let us go a little into the reasons why the earth under all barns where cattle are kept, why the plaster of old houses and cellar walls, always afford saltpetre. You well know that this is the case, and why? We have already told you, that the acid of saltpetre, that is, the aqua-fortis, is formed of the air we breathe. Now alkalies and porous bodies compel the constituents of air, under certain circumstances, to unite and form aqua-fortis, and this immediately unites to the alkali, and forms saltpetre. The best alkali to compel this union, is ammonia. Hence, where plenty of animal matter is fermenting, or rotting, or where plenty of urine is, there, porous bodies being present, saltpetre will be formed. Now this is enough for you, to understand the principle upon which I propose to you to form an artificial nitre bed for your own use. It has been found that the manure of twenty-five cows, asses, and mules, in layers of about four inches thick, with layers of the same thickness of chalky soil, first one and then the other, and now and then damped with the urine of the stable, produces from 1,000 to 1,200 lbs. of saltpetre in four years.

The heap is formed under cover, and occasionally shovelled over. At the end of two years, it is a mass of rich mould. It is left two years longer, with an occasional turning over, but it is not wet with urine for the last few months. The dung the farmer has always, he wants the porous chalky body. This may be furnished by spent ashes, mixed up with its bulk of loam. Hence the following rule may be given: One cord of clear cow-dung one cord of spent ashes, one cord of loam or swamp muck. Mix the ashes and the swamp muck well, and having hard rammed the barn-cellar floor, or that under a shed, lay a bed upon it four inches thick, of these mixed materials: then a layer of dung, three or four inches thick, and so on, till the pile is two or three feet high, topping off with loam. wet it occasionally with urine, keeping it always about as moist as garden mould. Shovel over once a fortnight for two years. The pile now contains about fifty pounds of several varieties of saltpetre, and mixed throughout with nearly three cords of excellent manure. It may therefore, be now used, according to the farmer's judgment. By thoughtful management, he may, after the first two years, annually collect as many fifty pounds as he employs cords of cow dung. But, however prepared, nitre affords, by its elements, nourishment to plants. All its parts act. Its alkali acts, and its acid acts.

ASHES.

It is easy to see, that salts, whatever be their name or nature, which are likely to be of any service to the farmer, are those only which, by the action of their acid or base, act on the earthy parts of soil, or upon the mould. Salts either poison, or nourish plants. The first, like the medicines we take, are good in small doses; the second, can hardly injure, even by their excess. If we recur to the principle, with which we set out early in this essay, that the ashes of plants contain all their salts, then, rightly to know what salts are likely to produce good effects as manure, we should first study the composition of ashes. We have, in ashes, a great variety of substances. They come from the soil They form a part of plants, The dead plant returns them again to their mother earth, or we, losing the volatile parts of a plant, its mould and ammonia, by burning, collect its salts as ashes. Let us see what these salts are made of. In the first place, you know, all salts are composed of an acid and a base.

The bases are	*The acids are*
Potash & Soda,	Carbonic, or carbon united to oxygen.
Lime,	Phosphoric, or Phosphorus, do
Magnesia,	Sulphuric or Sulpher, do. do.
Clay,	Muriatic, essentially composed of chlorine.
Iron,	
Manganese,	
Silix, or the earth of flints.	

Now if we throw out the carbonic acid, which has been formed in burning, we have left in ashes, three acids, which are united with the bases, and may form the following salts in plants, namely: Glauber's salt, Epsom salt, common table-salt, bone-dust, a salt of lime, and what we may term a bone-dust salt of iron, or phosphate of iron, plaster of Paris, or gypsum, copperas, alum, and some other salts, which need not be enumerated. Our list comprises the principal, and those most likely to be used in farming. Well, now, the lesson to be drawn from this composition of ashes is this, that there is scarcely any salt occurring in commerce, which may not be used in agriculture, instead of those found ashes. In fact, almost all salts which occur in a large way, as refuse materials from manufactures or sources, have been used, and all with greater or less success, as manures. And if you cast your eye over the acids and bases of common ashes, this seems quite reasonable. It is not expected that a plain farmer, possessing little or no chemical knowledge, should be able to tell beforehand, what the effect of a salt would be, applied to his land; but if he understands what the composition of ashes is, he may be sure that in any quantity in which the salt is likely to occur, it cannot be injurious, provided it is mixed up with plenty of mould, and a little ashes, or alkali, which will kill or neutralize any excess of poisonous acid.

In ashes, we have one, part which may be leached out, and a part which remains after leaching, called spent ashes. Let us see then in leaching, what parts we take away. First, we take away all the acids except the phosphoric, Secondly, we take away nearly all the potash and soda. What is left? The phosphoric acid, and all the bases. It is evident, therefore, that the strength of ashes can never be wholly leached out. if that depends upon the salts. In spent ashes, we have nearly all the bone-dust left; and, besides this, a portion of what is usually considered the real strength, that is, the potash. This is chemically united to certain of the other constituents of ashes. You cannot leach it out, leach you never so long. Upset your leach-tubs, shovel over your spent ashes, mix it up with fermenting manure, where a plenty of fixed air is given off. Here is the secret of the value of spent ashes, so far as the potash or ley strength is concerned.. This exposure to air, to carbonic acid, lets loose the potash, which was chemically combined with the other matters. Water would never have done this. Mark now a practical lesson, taught here by chemistry, and confirmed by experience. Leached ashes must never be used on wet soil, if we want its alkali to act. The close wet soil, perhaps even half covered at times with water, excludes the air. The carbonic acid of air, that which alone extracts the alkali from spent ashes, cannot here act. There is this other lesson to be learned from these facts, that it is chiefly the alkaline action, which is wanted from spent ashes. Hence no one who thus understands the source, and the true value of ashes, will allow the alkaline portion to be first leached out, unless he can find a more economical use for it, than its application as a fertilizer. Perhaps no fact speaks louder, that the great action of spent ashes is that of its potash, than this, that where we prevent that from being extracted, the spent ashes are of little value. If, then spent ashes derive their great value from the potash, much more will unleached ashes derive their value from their potash.

Now, reader, the point to which I have led you, in these remarks, is this, that the more alkaline any salt is, the better is it for manure, Hence, as a general rule, about the best of ash, pearl ash, common ashes, barilla ashes, white, or soda ash, are the best. And as these in all their various shapes, are the cheapest and most common articles, so you need not run after a long list of other salts. Next in value to the real alkalines, you would derive the greatest benefit from them. Next to these comes peat ashes. You well know these are of no value to the soap-maker. But not so to you. They show only traces of alkaline power. But treat them as you did spent ashes. Their power, independent of their bone-dust, which is by no means small, and their plaster, which is still greater, and their lime which is perhaps the greatest, lies in the alkali, which is locked up, as it is in spent ashes. Treat them, therefore, as you did spent ashes. and then peat ashes will and do afford alkali. So too coal ashes, even your hard anthracite ashes, yield all the substances which spent ashes do. It is easily seen, therefore, when, how, and where, spent ashes, peat ashes, coal ashes are most likely to do good. Perhaps we may not have a better place to state the fact, that a cord of soap-boiler's spent ashes contain about fifty pounds of potash. When we add to this one hundred and seventeen pounds of bone-dust, and about a ton and a half of chalk, or carbonate of lime, which acts chiefly on the soil, and so comes not now under consideration, it is seen, that there is no cheaper source of alkali and salts, to one within reasonable carting distance of a soap-boiler than spent ashes. They are marl, bone-dust, plaster, and alkali combined.

VARIETIES OF SOIL.

Some of the most valuable improvements in modern agriculture proceed from the discovery that all plants do not exhaust from the soil, in which they grow, the same ingredients or component parts of it; and that no two plants of a different kind abstract the same proportion of each ingredient.

Hence, beyond all question, it is established: 1st, That every kind of soil is, in its natural state, fitted for the production of some one or other of the thousand plants that cover the earth; and 2d, That the addition to it, by human labour, of those ingredients or substances of which any soil is deficient will fit it for the production of plants that require those ingredients.