THE GLEANER:

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OLD SERIES] *Nec aranearum sane textus ideo melior, quia ex se fila gignunt, nec noster vilior quia ex alienis libamus ut apes.* [COMPRISED 13 VOLUMES.

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From the London Farmer's Magazine.

THEORY AND PRACTICAL USE OF LIME.

My attention has been drawn to these subjects by the perusal of Professor Daubenny's paper "read at the chemical section of the British Association, on Friday, September, 11, 1846," as it is recorted in the *Pharmeceutical Times* of the 26th *idem*. There are passages in that paper which can be profitably referred to as strictly true in themselves, as bearing upon the uses of lime in husbandry, and particularly as connected with its operation upon humus, and its availability in reclaiming waste, bog, or peat lands.

Dr. Daubeny observed that he had selected a topic which some may regard as almost exhausted; for all who have consulted the recent treatise of Professor Johnstone on Agricultural Chemistry will admit that he has communicated it in a very able and correct account of the uses of lime in agriculture.

With deference to such authority, and under the disadvantage of not having seen the treatise alluded to, I may still be permitted to observe that so far from the subject being exhausted, I conceive that few philosophers, and not one among a hundred of practical farmers, have ever formed a correct notion of the essentially specific agency of lime upon inert vegetable matter; and that, until Mr. Rowlansdon, of Liverpool, wrote his truly valuable articles upon liming, the world was ignorant of its peculiar corrective powers. That which Sir H. Davy taught about thirty six years ago, remained, and generally speaking, still remains in full force as an accredited theory. In his seventh Agricultural Lecture, speaking of limstone, chalks, marls, and other carbonates of lime, as compared with hot or quick lime he says:—"It is obvious that the operation of these substances depends upon principles altogether different." "Quick lime renders matter which was comparatively inert and nutritive; and as charcoal and oxygen abound in all vegetable matter, it becomes at the same time converted into carbonate of lime. It tend to bring any hard vegetable matter into a state of more rapid decomposition, and solution, so as to render it a proper food for plants." Again—"When lime, freshly burnt or slaked, is mixed with any moist vegetable matter, there is a strong action between the lime and the vegetable matter, and they form a kind of compost together, of which a part is usually soluble in water.

This view of the action of hot lime might rationally suggest itself to the mind of a philosophic chemist forty years since, and being promulgated at a period when agricultural chemistry commanded neither respect nor attention, by an authority so exalted, the few who thought on the subject at all might naturally seize and embrace as conclusive.

I entertained no other notion myself about the time that Leibig's first work appeared: I only, with others, endeavoured to show that in order to decompose surplus or crude vegetable matter, and liberate its elements, lime must not only attract the moisture, or free water of the herbage, but must disturb the chemical affinities of the elements which compose its tissue, so as to liberate the hydrogen and oxygen, causing them to re-combine as water, and to deposit the carbon in the form of black charcoal; in a word, that it must produce chemical combustion—without innition indeed, but nevertheless true in its results.

But while the theory, so far as it went, may be certain, we must premise that the lime so to act must be pure and unslaked, or in that very condition in which we find it when it absorbs and combines with water, in the act of slaking; otherwise it can never burn and consume the vegetable matters, even if applied to the extent of from four to eight hundred bushels per acre. Independantly, therefore, of its more destructive power, pure lime, that is to say lime free from carabonic acid, whether fresh from the kiln, or slaked by air or water (*i. e.* in the condition of hydrate,) must and does exert a chemical action peculiarly specific, and of vast importance to the agriculturist; and this I shall endeavour to render experimentally evident, after quoting one leading passage from the paper of Dr. Daubeny. It reads thus—

"Its effect in rendering the organic matters more soluble, or rather, as I should prefer to represent it, in promoting their decomposition so as to render them better adapted for supplying both carbon and nitrogen to growing plants, has been already sufficiently explained by Professor Johnstone and by others. Yet when we recollect that quick lime, mixed with pounded granite, speedily liberates the contained alkali, and that many of the clays and claystones which compose the bulk of several rock formations in secondary and tertiary districts are derived from granite rocks, we cannot doubt that the action of quick lime upon the latter will be of analogous discription.

These qualities of lime, that is to say, its solvent power, and that of liberating potash from rocks and clays, are very important: but they have little or no reference to the one which appears to be still more extraordinory.

Some years since, the theory of *humus* was broached; and for a time the cultivators of the ground were taught to consider it the all-in-all—the pabulum of nutrition—"the chief nourisher in life's feasts," or in other and more homely terms, "the cooked food of plants." Soon, however, the zeal of its partizans were checked, and then it appeared that humus was a slowly formed product of vegetable decay; and that so far from being a wholesome food, its predominance became a medium of barrenness and destruction. Peat bogs, flow-mosses, and indeed, all submerged masses of vegetable matter, abound with humus: and these, so long as they remain in their natural condition are worthless, and unproductive of good cerial or garden crops. Lime, duly applied in tillage, is the grand chemical remedy; it exerts a specific action not at all connected with any solvent power, and this has been clearly and unequivocallyexplained by Mr. Rowlansdon of Liverpool. He has entered into a minute chemical detail of facts, and has shown by irresistible evidence that his theory of the remedial action of quick lime is correct. Mr. Ruffin, of the United States, had paved the way for new researches upon calcareous manures, and his able articles were copied in the pages of the British Farmer's Magazine of 1835.

Since the appearance of Rowlandon's article I entered into several interesting experiments, a detail of which will substantiate the view taken by that gentleman on the chemical action of lime.

There are two or three substances which fairly represents humus. The first is the dark coloured mass that remains after long protracted fermentation of the dung mixen, and long after it has attained the state of which it is called "spit dung." The second, the dark brown remains of the bottom of a very old wood pile. The third, completely reduced leaf mold, or that peculiar modification of moor soil which is occasionaily seen in some heath commons. All these substances can be procured for experiment, and will furnish proof of the singular agency which lime must exert upon vegetable remains when reduced to the condition of humus.

If to a solution of caustic potash, soda—and particularly of ammonia—a portion of either of the aforenamed matters be added, much colouring matter may be extracted, conferring a deep brown tint to the solution. Water alone when heated to a boiling point, will extract a little of this colour, but to a comparatively trifling extent. From these facts, and by observing that the alkali employed loses causticity and some of its acrid taste, chemists have concluded that humus contains an acid principle, to which the modern term "humic acid," has been applied; and if we admit that a combining power between alkalies and other substances in an opposite state of electricity is sufficient to establish the presence of an acid, we will not dispute the correctness of the term.

But if in lieu of any of these pure alkalies, lime be employed, whether in powder or as strong lime water, colour will be destroyed, and the supernatant liquid will become very pale. Thus for an example—Take one ounce of any of of the three substances named, mix with it a quarter of its weight of powdered quick lime, and pour on the mass a pint of boiling rain water. After stirring to blend the whole, let the mixture repose for a time. At first the floating liquor will be turpid, but it will finally become clear, and nearly void of colour.

This experiment may justly be considered inconclusive, for the effect of the lime might be deemed negative. However, having prepared any of, or all the brown liquids, that is to say, the soluble humate of potassa of soda and of ammonia, take a known measure of any one of these, more or less, and add to it either a small quantity of lime in powder, or so much strong lime water as shall be required to produce the effect, which will speedily become sufficiently evident. In either case a precipitate will be produced, and the liquid will be nearly deprived of colour.

Here we perceive a positive or direct action of the lime, for it becomes evident that its affinity for the humic attractive acid is so strong as to take it from its alkaline base, whether that base has been potash, soda, or ammonia.

The same phenomena will occur if common heath soil, bog, or turbary peat moss to be the subject of experiment. Mr. Rowlassdon anncunced these results in the "Journal of Agriculture," and I can vouch, by the evidence of repeated experiments, that his conclusions are faithful, so far at least that they can be attested by solutions of any of the humus substances obtainable in farm or horticultural establishments, further confirmation may be attained by testing that dark coloured liquid from farm dunghills, which, throughout the kingdom, is so laudably and economically squandered by our sons of the soil. If lime be added to it in any form, the same percipitate will occur, with considerable reduction of colour; and thus we are enabled to sum up the qualities of quick lime in the space of a few lines.

1. If applied to green vegetables, quite hot from the kiln, it will destroy the tissue and carbonize the substance, itself being brought into the state of mild lime or chalk.

2. As powdered or air slaked lime, it will directly kill slugs, and moluscous vermin, acting by its peculiar attraction for water.

3. As an alkali it will neutralize acids of every description, and hence is peculiarly useful if dusted over trees infested with lichens.

4. Its affinity for humic acid is predominant, as we have seen; and, therefore it becomes a specific remedy, wherever there is a redundance of inert decayed vegetable matter.

5. According to high chemical authority, it is capable to liberate potassa from clay and granite rocks, and to set it at liberty from its combination with flint as an insoluble silicate of potassa.

6. It is a mistake to suppose that quick lime renders animal and vegetable remains soluble. These substances are partially soluble, as we have seen in the three akailies; but the precipitate formed by the addition of lime is not soluble, or at any rate, it is so far fixed that it will remain long quiescent in the ground, from which it can only be taken up in very small quantities and by slow degrees, according to the capacity of the vegetable for such food.

Lime, then, acts as an antidote of redundant humous matter, attracting and fixing its acid, as an innocuous humate; and thus, upon the above principles, I hope that I have not only established unequivocally the importance of lime as a prime agent and corrective, but have in a degree "relieved the bewilderment" of "A Constant Reader" who, at page 325 under "Agricultural Queries," solicited some information on the properties of lime.

From the Southern Planter.

A GOOD PLAN OF MAKING MANURE.

Have a pit thirty or forty feet square, and two or three feet deep, with a good bank around it. In this pit let the materials, viz. oak leaves, pine tags, earth, &c., be put in suitable layers, on which, throw all the slop water, soap suds, yard sweepings, as lay, contents of chambers, and in short, everythiug thing can be conveniently got together. It may be at any convenient distance from the kitchen, so that the slop water, soap suds, &c., may be conducted to it by a trough. Be sure that no water gets into in any other way. If at any time it becomes offensive, start your teams immediately and cover it immediately with sand or earth sufficient to prevent the escape of and effluvia. We say we approve of this plan of making manure; but we think it might be improved by sowing plaster over such layer of the materials of which it is composed, and occasionally, say at intervals of two or three weeks, sowing it over the surface, by which means all unpleasant smells would be avoided, and the enriching gases may be saved to fatten the land. Any pit which may be made for the purpose should be protected from the weather.

Mixing manure with the soil.—A very great loss which most farmers sustain, is a want of thorough admixture of manure and soil. The manure is thrown on the land, and spread in large lumps, the plow perhaps but half covers them, and forms only a mixture of clods and unbroken masses of manure, entirely unfitted for the fine fibres of the root.

One of the most useful practices is, to harrow the surface of the ground from eight or ten times after the manure is spread, and before it is plowed in, thus breaking it up as finely as possible, and mixing it with the finely pulverized soil. A farmer who has adopted this practice is of the opinion that manure is thus of more than double the value to the first crop, that it is in the usual way of plowing in. When it cannot be plowed immediately after spreading, the harrowing mixes it and prevents evaporation into the air.

Construction of Cow houses.—A Correspondent in the Irish Farmers' Gazette observes:—"While lately on a visit to Scotland, I was much pleased with the simple and convenient mode of tying cows practised in that part I was in, and am now engaged in fitting up my own after the same manner. The plan is as follows:—Suppose the house is adapted to hold twelve cows, six flags, of about 4 feet long by 3 1-2 broad, are set up on edge, at intervals of about seven feet distant, the ends of them are secured in the front wall, on each side of the flag, about a foot from the ground, a staple and ring is inserted for holding the chain, which is hooked round the neck of the cow. Each stand is thus fitted to hold two cows. Now, the great advantage of this plan is, that they are completely prevented from going or annoying each other while at their food, for each must stretch nearly seven feet before she can touch her comrade. They are also kept straight in their stands, by the flags, and do not turn round to wet or dirty each other, as they usually do when tied in a common way. There are no cribs, or feeding troughs erected before them, as these always tend to gather dirt and refuse, and the Scotch byres are kept as clean and neat as a kitchen. In no department of farm management did I see the principle of economy of time and labor better carried out than in the management of the house and offices, they generally form three sides of a square and the cow house invariably communicates with the dwelling house by an outside door. In that part, which is gene-