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By M. MACLEAN.

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AGRICULTURAL.

From the *Western Farmer and Gardener*.
AN ESSAY ON THE IMPORTANCE OF LIME IN SOILS.—NO. II.

Having, in the former number, attempted to show that lime is an essential constituent in all soils devoted to the cultivation of such plants as are used by man and beasts for food, in consequence of its entering into the composition of such plants, and that all soils destitute of calcareous matter are comparatively barren and unproductive;—I shall, in the present number, offer some reasons to establish the fact of the importance of lime in improving the fertility of soils, based upon its chemical and mechanical effects when present in the soil.

Every soil capable of producing plants, contains organic substances, either of vegetable or animal origin, or both—but chiefly of vegetable origin. No soil wholly destitute of organic matter can support living vegetation.* It is, therefore, evident that the presence of organic matter in the soil is essential to the production of vegetation. And it is also shown by every day experience, that the constant growth of plants, without the addition of organic matter, by the application of manure, or other means, will sooner or later completely exhaust the soil of its power of sustaining vegetation; and that by the addition of organic substances to the soil, this power is again restored, provided all other essential ingredients be present.

Until very recently, the nature and properties of the organic substances contained in soils, had received but little attention from those engaged in the investigations of agricultural chemistry.—Within the last few years, however, the attention of scientific chemists has been especially directed to the examination of the organic substances found in soils, and to the peculiar states in which they should exist in the soil, in order that they may be appropriated by the living plant to the production of a new vegetable organization.

All organic matters, and especially vegetable substances, when deprived of vitality, and exposed to the action of air and moisture, undergo various chemical changes, and they are ultimately converted into a brownish or black mass, that has been honored with a great variety of names, but which chemists have now pretty generally agreed to distinguish by the name of *humus*.

Klaproth first discovered this substance in the gum of an elm, and thence gave it the name of *ulmin*. Berzelius found the same substance in all herbs. Braconnet found it in saw-dust, starch and sugar; and Sprengel and M. Pollydore Boullay found it contained in all soils and manures, and thence called it *humus*, from soil. Berzelius, the celebrated Swedish chemist, continuing his researches upon this substance, considered it identical with apotheme, and abandoned all the previous names it had received, and called it *geine*, (from earth,) or extract of mould. The insoluble portion of geine he called *carbonaceous humus*. In 1832, Berzelius discovered in the waters of Porla spring in Sweden two peculiar acids, which he named *crenic acid*, from the Greek, *krene* a fountain, and *apocrenic acid*, meaning from the crenic; and upon further examination he discovered that the substance which had received the names of ulmin, humus, geine, apotheme, extract, &c., was identical with the *crenic and apocrenic acids* found in the water of Porla spring; so that all the former names may be discarded, retaining only, for the substance formed by the combination of crenic and apocrenic acids, and by the decomposition of organic substances, the generic name of *humus*.

Professor Liebig, in his recent work on Organic Chemistry, defines humus to be "woolly fibre in a state of decay," and says: "The opinion that the substance called humus is extracted from the soil by the roots of plants, and that the carbon entering into its composition, serves, in some form or other, to nourish their tissues, is so general, and so firmly established, that hitherto any new argument in its favor has been considered unnecessary; and the obvious difference in the growth of plants, according to the known abundance or scarcity of humus in the soil, seemed to afford incontestible proof of its correctness. Yet this position, when submitted to strict examination, is found to be untenable, and it becomes evident from most conclusive proofs that humus in the form in which it exists in the soil does not yield the smallest nourishment to plants. (Liebig's Organic Chem., p. 61.) On page 69, Liebig states that "it is universally admitted that humus arises from the decay of plants. No primitive humus, therefore, can have existed, for plants must have preceded humus."

The following is Liebig's view of the action of humus in the nutrition of plants. Humus acts in the same manner in a soil permeable to air, as in the air itself: it is a continued source of carbonic acid, which it emits very slowly. An atmosphere of carbonic acid, formed at the expense of the oxygen of the air, surrounds

every particle of decaying humus. The cultivation of land, by tilling and loosening the soil, causes a free and unobstructed access of air. An atmosphere of carbonic acid is therefore contained in every fertile soil, and is the first and most important food for the young plants which grow in it. The roots perform the functions of the leaves from the first moment of their formation; they extract from the soil their proper nutriment, viz. the carbonic acid generated by the humus.

When kept in a dry place, humus may be preserved for centuries; but when moistened with water, it converts the surrounding oxygen into carbonic acid. As soon as the action of the air ceases, that is, as soon as it is deprived of oxygen, the humus suffers no farther change. Its decay proceeds only when plants grow in the soil containing it; for they absorb by their roots the carbonic acid as it is formed. The soil receives again from living plants the carbonaceous matter it thus loses. So that the proportion of humus in it does not decrease. (Liebig, p. 196.)

Dr. Charles T. Jackson, in his investigations connected with the geological survey of Rhode Island, has made extensive and valuable researches and observations on the substance of humus; and as his labors are of more recent date than those of Dana or Liebig, and differ from them in some essential particulars, I shall quote his views somewhat at large.

Much confusion appears to exist as to the nature and names of the organic matters contained in soils, and it is probable that in the several stages of decomposition of different substances, a variety of changeable compounds are produced that have not yet been fully examined.

During the last year, (1839,) I have endeavored to ascertain the nature of the extractive matters obtainable from the humus of soils and from peat, and have ascertained that the principal mass of those substances, to which the names of humus, geine, and apotheme have been applied, is a compound of the crenic and apocrenic acids, which are in part combined with bases, such as the per-oxide of iron, manganese, lime and magnesia. The soluble extract of humus is mostly composed of crenic acid, sometimes combined with lime and per-oxide of iron.

After the discovery of these acids in the soils and peats of Maine, Massachusetts, and Rhode Island, I had the curiosity to examine the soils from the continents of Asia, Africa, and those from the West Indies, and from the Western states of this country. In all of them I have discovered cremates and apocrenates. I have also detected the crenic acid in various waters from lakes, rivers, and wells, so that there can be no doubt of its being generally present in arable soils.

Cremate of lime is soluble in water, and, is, without doubt, an active agent in the nourishment of plants. Apocrenate of lime is more difficult of solution, but is slowly taken up and colors the water yellow. It is sufficiently soluble to supply the rootlets of plants. All the alkalies, both fixed and volatile, dissolve crenic and apocrenic acids; ashes, the alkalies, potash and soda, carbonate of ammonia, and even the alkaline earths, render the inert cremates, and apocrenates, in the soil, soluble and active, while the alkalies and acids neutralize each other, and render the soil more fertile.

Many of the lake waters around Boston contain the crenic acid, either separate or in combination with lime, manganese, or iron. It is found in the water of most of the wells in the city, and I doubt not is universal.

Any chemist can foresee some of the consequences that may be deduced from the above data, and that by chemical means we can bring some of these new combinations to bear upon the art of agriculture. If the per-oxide of iron in a soil is really in combination with crenic and apocrenic acids, then we can understand why the land is improved by means of an application of ashes and lime, which will dissolve the vegetable acids, and render them convertible into food of plants. Carbonate of ammonia, which is known as one of the most powerful stimulants, as it is improperly called, is capable of dissolving these new acids, and will take them from lime, manganese, and magnesia. Hence, the value of animal manures, which generate ammonia, will be understood.

From all that has been said and written about humus, geine, apotheme, ulmin, ulmic acid, humic acid, crenic and apocrenic acids, &c., we may conclude, that all soils contain organic matters; and that these matters may exist in the soil, in all stages of decomposition, from the fresh and perfect vegetable and animal substances, down to the complete extinction of all organic structure; and that during the progress of this process of disorganization, a part of the organic matters are disengaged or set free from their original combination in the form of gaseous,

saline, and earthy matters, which are left in a condition to enter into other combinations, and form new compounds, or be dissipated in the air, or absorbed and mixed with the soil, or they may be taken up by the roots of living plants and form a new vegetable structure.

When the process of the disorganization of organic matter has proceeded to a certain extent, the residue of the mass, that has not been dissipated in the form of gas, or separated in the form of saline and earthy substances, assumes a fixed and determinate character, and no further decomposition or transformation occurs; and if it be not exposed to air and moisture, will remain unaltered for ages, until it is again exposed to the action of air and moisture, or to the action of the alkalies or alkaline earths. It is this substance which is called humus. Dr. Dana considers it a "definite proximate principle," and Dr. Jackson has discovered that it consists of two new acids. Both, however, agree that the action of alkalies and alkaline earths will render it soluble and fit for the food of plants, whether it be called "geine," "apocrenic and crenic acids," or "humus." It is therefore of but little importance to the practical farmer by what name the substance is called, provided he has a clear conception of the substance itself, and a knowledge of the manner of converting it into food for his plants.

Air and moisture will convert a portion of humus into a state in which it is easily soluble in water. Lime speedily converts the remaining portion which is of difficult solution, into a soluble state. Alkalies convert it into a state in which it has acid properties, and in that state it will readily combine with earths, alkalies, and oxides, forming neutral salts, which are readily soluble in cold water, and these salts are, by the action of carbonic acid, rendered still more soluble. Growing plants act upon the silicates contained in the soil, set free the potash and other bases, which act upon the humus, and convert it into food of plants. The oxygen of the air acting upon humus produces carbonic acid, which forms a large portion of the food of plants. And likewise the oxygen of the air unites with the hydrogen of the humus and forms water, which again dissolves more humus. Ashes, which contain potash and lime, act upon the humus to render it soluble. Ammonia, contained in animal manure and urine, as well as in snow and rain-water, acts upon humus to render it soluble. Carbonate of ammonia has a greater affinity for humus than lime, iron, manganese, or magnesia.—Gypsum, by being decomposed in the soil, by the carbonate of ammonia contained in the rain-water, forms sulphate of ammonia and carbonate of lime, both of which act upon the humus of the soil and convert it into the food of plants.

Lime is considered by both Drs. Dana and Jackson, to be the chief solvent of the "geine" of the first, and the "crenic and apocrenic acids" of the latter gentleman. There are, however, various other acids existing in a free state in the soils, which have the effect to arrest the conversion of woolly fibre into humus, and consequently prevents it from becoming the food of plants, until lime has been applied to neutralize these acids and allow the process of the formation of humus to proceed. Peat is a remarkable instance of this kind. The vegetable substances, by the action of acids, is prevented from becoming converted into humus, until neutralized by lime, and peat then forms one of the best compost manures a farmer can have.

The chief and most important advantage to be derived by the farmer in the application of lime to the soil, consist in applying it in contact with fresh vegetable and animal substances, either in a compost heap, or by ploughing them into the soil. By this method we obtain the benefit of the action of the lime upon the fresh vegetable fibre, to convert it into a state of fermentation, in which an abundance of carbonic acid is produced, and if animal manures be used, ammoniacal gas is likewise formed, both of which will be absorbed and retained in the soil by the lime, but which would otherwise escape into the air and be lost, before the vegetables intended to be grown upon the land could be sufficiently advanced to appropriate their gases as food. The remaining portion of the manure and vegetable fibre would still pass into the state of humus, and the lime in its form of a carbonate, will proceed to dissolve the original humus contained in the soil, as well as that newly formed; and should any free acids be present in the soil, which will frequently be the case when fresh vegetable substances are ploughed into the soil, the lime combines with such acids, and yields the carbonic acid, to the roots of plants.

From Miss Leslie's Magazine.

THINGS WORTH KNOWING.—No. 1.

BY MISS LESLIE.

To soften Sponges.—A sponge, when first purchased, is frequently hard, stiff, and gritty. To soften it, and dislodge the particles of sea sand from its crevices, put the sponge into a clean vessel of water, and boil it about an hour, (or more) changing the water twice; or three times if it is very gritty; letting the sponge cool so that you can squeeze it thoroughly before putting it into fresh water. When the sponge has become quite soft, and there is no more appearance of sand or

grit, squeeze it out, and it will be fit for use. A brown sponge, prepared in this way, is quite as good as a white one. But you may bleach it by adding to the water, when boiling, a few drops of oil of vitrol.

After using a sponge, always wash it immediately in clean water; squeeze it out, and let it dry.

To clean looking-glasses.—Take a newspaper or a part of one, according to the size of the glass. Fold it small, and dip it into a basin of clean cold water. When thoroughly wet, squeeze it out in your hand as you would a sponge, and then rub it hard all over the face of the glass; taking care that it is not so wet as to run down in streams. In fact, the paper must be only completely moistened or damped all through. After the glass has been well rubbed with the wet paper, let it rest a few minutes; and then go over it with a fresh dry newspaper (folded small in your hand) till it looks clear and bright—which it will almost immediately; and with no farther trouble.

This method (simple as it is) is the best and most expeditious for cleaning mirrors, and it will be found so on trial—giving a clearness and polish that can be produced by no other process. It is equally convenient, speedy, and effective. The inside of window panes may be cleaned in this manner, to look beautifully clear: the windows being first washed on the outside. Also, the glasses of spectacles, &c. The glass globe of an astral lamp may be cleaned with newspaper in the above manner.

Dusting furniture.—If a hand-brush is used for dusting furniture, it should always be followed by a dusting cloth. A brush merely disturbs the dust without taking it up or absorbing it; and is only useful in dislodging it from crevices. Therefore, if the dust is not afterwards wiped up in a cloth (which should be frequently shaken out of the window) it floats about the room, and settles again; being only removed from one place to spread itself on another. A yard of sixpenny calico will make two small dusters, or one large one.—They should be hemmed, that the servants may not regard them as mere rags, to be torn up, or thrown away when dirty.

To keep a muff smooth.—Always, after putting it into its box, take hold of the top or upper end of the muff, and give it several hard twirls round. This will smooth the fur, and make all the hairs lie the same way. Keep in the box, two or three lumps of gum-camphor, wrapped in paper to retard evaporation. Camphor is the best preservative against moths. When you finally put away your muff in the spring, place about it half a dozen lumps of fresh camphor, each wrapped in a paper. Close the lid tightly, and do not open it till the return of cold weather. To prevent the wadding of the inside of the muff from falling downwards, or getting into clods, keep the muff-box always lying on the side instead of standing it upright.

A black lynx muff is rarely, if ever, attacked by moths.

To clean white fur.—Take a sufficient quantity of dry starch, very finely powdered, and sift it through a fine sieve into a clean bread tin pan.—Set the pan near enough to the fire for the powder to get very warm, stirring it frequently. Then roll and tumble about the white fur article among the starch, till it is well saturated. Shut it up closely in a bandbox, and let it remain unopened for a week or two.

When you put away white fur in the spring, proceed as above, (using a large quantity of the pulverized starch,) and put into the box some lumps of camphor tied up in papers. Keep the box closely shut, and do not open it to look at the fur till the beginning of next winter. It will then be found a good clean white.

PRESIDENTIAL NOMINATION.—The following Preamble and Resolutions, offered in the House of Representatives of our Legislature, by Col. Albert Rhett, were unanimously agreed to by both branches:

"The people of South Carolina have witnessed with high gratification, the growing disposition of the Democratic Party throughout the Union, to call their eminent citizen, JOHN C. CALHOUN, to the highest office in the gift of the American People. They have been heretofore restrained from proposing him as a candidate for this distinction, by high considerations of delicacy, and by the confident belief that, in spite of temporary misconceptions, his worth and services would ultimately enforce from his whole country a just appreciation and candid recognition. But they are of opinion the time has now arrived, when justice to themselves and to one who has served them so faithfully, demands that they should put forth to the world, an expression of their unlimited confidence in his abilities and integrity, and preference of him over all other men, for the office of Chief Magistrate of the Union.

"The approaching election for President is one of momentous importance to the great cause of Constitutional Liberty, to which this State has long been conspicuously pledged. Our people are profoundly solicitous, as to the result, and believe that it vitally involves their interests and dearest rights; and this Legislature would shrink from an obvious and imperative duty, and be guilty of dis appointing and misrepresenting their constituents, did it adjourn without giving direct and solemn expression to the unanimous wish of the people of South Carolina.

"They look forward with sanguine expectation to the triumph of the Democratic Party, but they believe it as essential to the ensuring as it is to the value of such a triumph, that the Candidate of the party should be clearly identified with the principles to which they stand so directly pledged, and should, if elected, rest his administration of the Government upon the broad basis of 'Free Trade, Love Duties, No Debt, No Connection with Banks, Economy, Retrenchment, and a strict adherence to the Constitution.'"

"Should a National Convention, so timed and so organized as to ensure that the matured opinion of the Democracy of the Union shall be clearly ascertained and fairly expressed, bestow their preference on any other member of the Democratic party, as a Candidate, than him who is the pre-eminent choice of the people of this State, South Carolina

will be permitted to submit her wishes to the general good, and render to the Candidate selected, her cordial support.

"Be it therefore unanimously Resolved, by the Senate and House of Representatives in General Assembly met, That, in consideration of the loyal and faithful services, the unselfish private honor, the political integrity, distinguished abilities, fearless virtue, and sound Constitutional principles of their fellow-citizen, JOHN CALDWELL CALHOUN, they do hereby nominate and recommend him to the American people for election to the office of President of the United States."

OUR RUINED CITY AND COUNTRY.—There is scarcely another instance on record of a city having increased so rapidly in population, and for so long a period, as has the city of New York.—The ratio of increase is much larger than in the country at large, as will appear from the following statement:—

POPULATION OF			
	New York.	La	United States.
In 1800	60,459	La 1800	5,305,925
1810	96,373	1810	7,239,614
1820	123,706	1820	9,638,131
1830	203,207	1830	12,866,930
1840	312,710	1840	17,062,566

The average rate of increase in the city of New York, is a trifle over 51 per cent. for every period of ten years since 1800, while that of the country at large is a little short of 34 per cent.

The city has increased in a much greater ratio since 1820, than it had done previously. It will be found on trial, that for each of the two periods subsequent to that date, its increase has been at the rate of 62 per cent., while in the United States, for the same time, the increase has been at the rate of only 33 per cent. for each period.

Should the city continue to increase at the rate of 51 per cent., for every period of ten years during the remainder of the 19th century, its population, on the return of each decade, would be as follows:

In 1850	472,192
1860	713,009
1870	1,073,643
1880	1,623,730
1890	2,454,852
1900	3,706,806

Should the United States increase, in future, in the rate that they have followed since 1800, they will have attained a population of at least 52,000,000 in 1880, and of 92,000,000 in 1900.

We do not say that so vast an increase is to be expected, or desired. But the above are the numbers which would result from a rate of increase like that of the past. What is to become of this immense population? Is it to enjoy, as now, the blessings of freedom, moral and religious, or is it to fall under the dominion of a tyrant? Is it to be one united people, or split up into several independent and conflicting nations? Is Popery to predominate here, or is the Bible?—*N. Y. Jour. of Com.*

A POWERFUL MICROSCOPE.—A new microscope was recently exhibited in London, the powers of which are said to surpass all previous instruments. It consists of six powers. The second magnifies the wings of the locust to twenty-seven feet in length. The fourth, the sting of the bee to twenty-seven feet. By the sixth, each lens in the eye of the fly is so magnified, that it appears to be fourteen inches in diameter; and a human hair, eighteen inches in diameter, or four feet in circumference.

BOSTON AND CINCINNATI.—A Cincinnati paper says: When the Sandusky rail road is finished, Cincinnati will be within 3 days of Boston. From Cincinnati to the Lake, the distance may be accomplished easily in sixteen hours; a magnificent steam packet will then receive the passengers and transport them to Buffalo in twenty hours; and from Buffalo to Boston they will go by rail road, say in thirty-four hours; the whole distance from Cincinnati to Boston requiring only seventy hours. Does this prediction startle any one? In a few years it will pass into history, and be regarded as a very common place fact.

THE DEEDS OF ABOLITION.—The persons who are called a Vigilance Committee of the Abolitionists at Albany, have published a full report of their doings in relation to slaves during the past year. They state that they have aided about three hundred and fifty runaway negroes since the opening of navigation last spring. Of these fugitives, about one hundred and fifty were men, one hundred and fifty women, and fifty children.—Most of them came from Virginia, Maryland, and the District of Columbia, and nearly or quite a hundred from Washington and Georgetown.—These fugitives have gone chiefly to Canada, and the sum of five hundred dollars has been expended for their board, passage, and other expenses.—*N. Y. Evening Post.*

We have only to say, if the "Vigilance Committee" of the Abolitionists have made the avowal ascribed to them in the *Post*, that they ought forthwith to be indicted, tried and punished, for a direct violation of the law of the State of New York, of the laws of Congress under the Constitution of the United States. They are guilty of a high crime by their own showing, and every owner of a slave who can identify him as one of the runaways thus rescued from his hands, is entitled to receive the full value of his property and exemplary damages for the high-handed act of dispossession. If any of these owners can identify their slaves thus spirited away from them, and can bring the act home upon these "vigilant" violators of their rights—a suit in the United States Court would very readily reach them, and make them settle their "philanthropy" through their pockets. It is the grossest outrage that we have ever yet seen acknowledged voluntarily by the perpetrators.—*N. Y. Courier and Enquirer.*

HARD TIMES.—The Galena Gazette thinks that it is a great mistake for the merchants to cry out about hard times. They can sit by their stores

† Geological Report of Rhode Island.