AGRICULTURAL.

The following is from the New York Cultivator, and part of the system of *British Husbandry*, extracted from that Journal.

OF THE DIFFERENT SPECIES OF MINERAL MANURES.

Alkaline Earths, or Alkalies and their Combinations which are found unmixed with the remains of any organized beings, are the only substances which can with propriety be called fossil manures. The only alkaline earths which have hitherto been applied in this way, are lime and magnesia; though potassa and soda the two fixed alkalies, are both used to a limited extent in certain of their chemical compounds.

The most common form in which lime is found on the surface of the earth, is in a state of combination with carbonic acid or fixed air. If a piece of limestone or chalk be thrown into a fluid acid, there will be an effervescence. This is owing to the escape of the carbonic acid gas. The lime becomes dissolved in the liquor. When limestone is strongly heated, the carbonic acid gas is expelled, and then nothing remains but the pure alkaline earth; in this case there is a loss of weight; and if the fire be very high, it approaches to one half of the weight of the stone; but in common cases, limestones, if well dried before burning, do not lose much more than 35 or 40 per cent. or from 7 to 8 parts out of twenty.

When burnt lime is exposed to the atmosphere in a certain time it becomes mild, and is the same substance as that precipitated from lime water; it is combined with carbonic acid gas. Quick lime, when first made, is caustic and burning to the tongue, renders vegetable blues green, and is soluble, [i. e. dissolves,] in water; but when combined with carbinic acid, it loses all these properties, its solubility, and its taste; it regains its power of effervescing, and becomes the same chemical substance as chalk or limestone. Very few limestones or chalks consist entirely of lime and carbonic acid. The statuary marbles, or certain of the rhomboidal spars, are almost the only pure species; and the different properties of limestones, both as manures and cements, depend upon the nature of the ingredients mixed with the limestones; for the true and calcareous elements, the carbonate of lime, is uniformly the same in nature, in properties, and effects, and consists of one proportion of carbonic acid, 41.4, and one of lime, 55. When a limestone does not copiously effervesce in acids, and is sufficiently hard to scratch glass, it contains silicious, (sandy,) and probably alumminous, (clayey,) earths. When it is deep brown or red, or strongly colored of any of the shades of brown or yellow, it contains oxide of iron. When it is not sufficiently hard to scratch glass, but effervesces slowly, and makes the acid in which it effervesces milky, it contains magnesia. And when it is black and emits a fœtid smell if rubbed, it contains coaly or bituminous matter. Before any opinion can be formed of the manner in which the different ingredients in limestone modify their properties, it will be necessary to consider the operation of pure lime as a manure.

Quick lime, in its pure state, whether in powder or dissolved in water, is injurious to plants. In several instances grass has been killed by watering it with lime-water. But lime, in its state with carbonic acid, is a useful ingredient in soils. Calcareous earth is found in the ashes of the greater number of plants; and exposed to the air, lime cannot long continue caustic, for the reasons that were just now assigned, but soon become united to carbonic acid. When newly burnt lime is exposed to the air, it soon falls into powder; in this case it is called slacked lime; and the same effect is immediately produced by throwing water upon it, when it heats violently, and the water disappears. Slacked lime is merely a combination of lime, with about one-third its weight of water; i. e. fifty-five parts of lime absorb seventeen parts of water, and is called by chemists *hydrate of lime*; and when hydrate of lime becomes carbonate of lime by long exposure to air, the water is expelled, and the carbonic acid gas takes its place. When lime, whether freshly burnt or slacked, is mixed with any moist fibrous, 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. By this sort of operation, lime renders matter which was before comparatively inert, nutritive; and as charcoal or oxygen abound in all vegetable matters, it becomes at the same time converted into carbonate of lime.

Mild lime, powdered limestone, marls or chalks, have an action of this kind upon vegetable matter; they prevent the too rapid decomposition of substances already dissolved, but they have no tendency to form soluble matters. It is obvious from these circumstances, that the operations of quick-lime, and marl, or chalk, depend upon principles altogether different. Quick-lime in being applied to land, tends to bring any hard vegetable matter that it contains into a state of more rapid decomposition and solution, so as to render it a proper food for plants. Chalk and marl, or carbonate of lime, will only improve the texture of the soil, or its relation to absorption; it acts merely as one of its earthy ingredients. Chalk has been recommended as a substance calculated to correct the sourness of land. It would surely have been a wise practice to have previously ascertained the certainty of this existence of acid, and to have determined its nature in order that it may be effectually removed. The fact really is, that no soil was ever yet found to contain any notable quantity of uncombined acid. The acetic and carbonate acids are the only two that are likely to be generated by any spontaneous decomposition of animal or vegetable bodies, and neither of these have any fixity when exposed to the air. Chalk having no power of acting on animal or vegetable substances, can be no otherwise serviceable to land than as it alters its texture. Quick-lime, when it becomes mild, operates in the same manner as chalk, but in the act of becoming mild, it prepares soluble out of unsoluble matter. Boullon La Grange says, that gelatine oxygenized becomes insoluble, and vegetable extract becomes so from the same cause; now lime has the property of attracting oxygen, and, consequently, of restoring the property of solubility to those substances which have been deprived of it, from a combination of oxygen. Hence the use of lime on peat lands, and on all soils containing an excess of vegetable insoluble matter.—*Grisenthwaite.*

Effects of Lime on Wheat Crops.

When lime is employed upon the land where there is present any quantity of ammonia, which may, perhaps, be imbibed by the leaves of plants, and afterwards undergo some change so as to form gluten. It is upon this circumstance, that the operation of lime in the preparation for wheat crops depends; and its efficacy in fertilizing peat, and in bringing into a state of cultivation all soils abounding in hard roots, or dry fibres, or inert vegetable matter.

General principles for applying Lime.

The solution of the question whether quick-lime ought to be applied to a soil, depends upon the quantity of inert vegetable matter it contains. The solution of the question, whether marl, mild lime, or powdered limestone ought to be applied, depends upon the quantity of calcareous matter already in the soil. All soils are improved by mild lime, and ultimately by quick-lime which do not effervesce with acids, and sands more than clays. When a soil deficient in calcareous matter, contains more soluble vegetable manure, the application of quick-lime should always be avoided, as it either tends to decompose the soluble matters by uniting to their carbon and oxygen so as to become mild lime, or it combines with the soluble matters, and forms compounds having less attraction for water than the pure vegetable substance. The case is the same with respect to most animal manures, but the operation of the lime is different in different cases; and depends upon the nature of the animal matter. Lime forms a kind of insoluble soap with oily matters, and then gradually decomposes them by separating from them oxygen and carbon. It combines likewise with animal acids, and probably assists their decomposition by abstracting carbonaceous matter from them combined with oxygen; and consequently must render them less nutritive. It tends to diminish, likewise, the nutritive powers of albumen from the same causes; and always destroys to a certain extent, the efficacy of animal manures either by combining with certain of their elements, or by giving to them new arrangements. Lime should never be applied with animal manures, unless they are too rich, or for the purpose of preventing noxious effluvia. It is injurious when mixed with any common dung, and tends to render the attractive matter insoluble. According to Chaptal, lime forms insoluble composts, with almost all animal or vegetable substances that are soft, and thus destroys their fermentative properties. Such compounds, however, exposed to the continued action of the air, alter in course of time, the lime becomes carbonate, the animal or vegetable matter decompose by degrees, and furnish new products as vegetable nourishment. In this view, lime presents two great advantages for the nutrition of plants: the first, that of disposing of certain insolubl bedies to form soluble compounds, the second, that of prolonging the action and nutritive qualities of substances, beyond the term which they would retain them if they were not made to enter into combination with lime. Thus the nutritive qualities of blood, as it exists in the compound of lime and blood, known as sugar bakers' scum, is moderated, prolonged, and given out by degrees: blood alone applied directly to the roots of plants will destroy them, with few or no exceptions.

Lime promotes Fermentation.

In those cases in which fermentation is useful to produce nutriment from vegetable substances, lime is always efficacious. Some moist tanner's spent bark was mixed with one fifth of its weight of quick-lime, and suffered to remain together in a close vessel for three months: the lime had been colored, and was effervescent; when water was poured upon the mixture, it gained a tint of fawn color and by evaporation furnished a fawn colored powder, which must have consisted of lime united to vegetable matter, for it burnt when strongly heated, and left a residuum of mild lime.