I shall designate them either by terms which they have borne, or by properties which will enable all interested to recognize them. The upper portion of this district is composed mainly of

RED CLAY SOILS,

Formed from the shales which abound in it. These shales are imperfect, half-formed slates, which by their gradual degradation have formed, in a great measure, the soils adjacent to them.

These soils are compact, hard, firm, tenacious, retentive of moisture, and of a red color. They are true clays, silicate of iron and alumina, and they contain, also, some potash, soda, and other elements of plants, but not in a soluble form or condition. They are stiff, hard and compact—to improve them and all other soils we must set free their valuable matter, if present, and add whatever constituents may be deficient. These soils contain enough of potash and soda, have a fine physical condition, enabling them to absorb materials from the atmosphere; but are partially deficient in lime and magnesia, the latter of those substances in them is dormant. These soils should be in the first place drained, where that may be necessary; but this is not enough, their physical texture must be attended to, they must be made more porous, light, and accessible to atmospheric influence, they must have their deficiencies supplied; to attain the former, they should be freely supplied with the necessary organic matter. This will make them lighter and at the same time afford, by its decomposition, carbonic acid to dissolve the dormant materials in the soil.

But it is not enough to set free substances which may exist in a soil, unless they be all which are required. If there be deficiencies, these deficiencies must be supplied, more especially where their presence will not only supply what is wanting, but also render soluble that which is present, but not in a form capable of assimilation. In these soils there is an absence of lime and magnesia, not only this, but substances which, when insoluble and are practically absent, can be made soluble by the use of lime, and thus be practically present; there is then a double inducement for the application of lime on these soils, one is its absence, another the *practical* absence of substances which it can render soluble, and thus make present.

I have said that these soils, when compact, should have vegetable matter mixed with them in order to render them more light and porous, and more accessible to atmospheric influence, and that vegetable matter, by its decomposition, afforded a solvent for the elimination of dormant substances from the soil. But in order to obtain this vegetable matter, we must have all of the necessary inorganic matter, for before it there was no tree, plant or blade of grass on the earth. All of the mineral constituents were fully