

account of its humus, the high importance of which as a fundamental constituent of soils, has been repeatedly discussed in this and my former reports. Humus promotes the absorptive power of soils for the gases. It keeps the soil warm and at a constant degree of temperature, and, like clay, aids materially in retaining its moisture. But instead of increasing the stiffness of soils as clay does, it renders them, on the contrary, porous and friable, so that the more a soil contains of humus, the more of clay can it contain without becoming close and difficult to be plowed. Its principal feature, however, is its intimate connection with nitrogenous compounds, the transformation of which into ammoniacal products advances steadily with the decomposition of the humus. In this way, humus furnishes to the plants, besides water and carbonic acid, (the product of its own decay,) a constant and appropriate supply of ammonia to the very last of its existence.

As to the latter, (the directly nourishing substances,) it is evident that stable manure contains all the nutriments that were once extracted from the soil by the plants, and subsequently removed from it with the crop, and that its application to the soil is therefore simply an act of restitution, at least so far as it concerns these particular matters. The experiments made by Boussingault with grown animals, by a forage of not more than necessary for their sustenance, have, in fact, directly proven the identity of the ultimate composition of the food consumed, and of those matters which, in the meantime, were ejected from the animal body, as also their equal absolute quantity, if calculated for a certain period of time, at the beginning and end of which, the weight of the animal remained stationary. The totality, however, of the matters ejected from the animal body is in no way fully represented by the solid and liquid excrements alone; we know that a considerable part of these matters (amounting to about 2-5 of the whole) are evolved in the form of water, carbonic acid and ammonia, from the lungs and through the skin of the animal, by the processes of breathing and perspiration. These substances being volatile, are diffused in the atmosphere, and consequently waste a large portion of the food, by the transformation of which, under the process of life, they were produced; and it is only the remaining portion of the food which reappears in the form of solid and liquid excrements, and such other substances as milk, &c., as may be collected by the farmer, and thus be of direct benefit to him.

From these facts, relative to the connection between excrements and food, we may judge, a priori, of the most probable composition of the former. We have seen that carbon, hydrogen, nitrogen and oxygen, the constituents of the organic portion of food, become partly separated from it in the animal body, and are evolved in the form of water, carbonic acid and ammonia. The