

with all those which contain, besides the above named elements, nitrogen as a constituent part. Small quantities of sulphur and phosphorus also generally accompany them. Urea, the chief constituent of urine, may be regarded as a representative of this class of organic matters, and we may find at once, that its decay or putrefaction differs somewhat from the process mentioned before, as it does not altogether consist in an oxydation of its carbon, hydrogen and nitrogen, at the expense of the atmospheric oxygen. Urea becomes gradually transformed into gaseous carbonic acid and ammonia, of which the former carries away all the original carbon, whilst the latter embraces the whole of its nitrogen and hydrogen. But there is originally not enough of hydrogen in urea so as to combine with the whole of its nitrogen to form ammonia, and the balance must therefore necessarily be furnished by some source from without. In accordance with this, practical observations have shown that it is water to which this important function has to be attributed; the presence of moisture being, as we know, one of the conditions for putrefaction. The water, most remarkably, suffers a gradual decomposition itself, when in contact with the putrefying substance, and becomes thus divided into its elementary constituents, hydrogen and oxygen, of which the former, at the moment of its being liberated, unites with any excess of nitrogen to form ammonia, whilst the latter, in common with the oxygen of the atmospheric air, transforms the whole of the carbon into carbonic acid.

Returning to barn-yard manure, it is evident that we have both classes of organic matters, the rotting and putrefying principles, fairly represented in its composition. There is the litter-straw of wheat or Indian corn, nearly identical with wood-fibre; and on the other side, intimately mixed with the former, the various nitrogenous compounds, including urea, as they occur in the solid and liquid excrements of animals. Left to itself for a sufficiently long time of exposure, barn-yard manure may, therefore, once become wholly converted into water, carbonic acid and ammonia, and will then, with the exception of its mineral constituents, entirely disappear from the ground. This effect is, as we know, actually produced in the body of the soil to which stable manure is applied; our experience teaching us that, in the course of time, no trace of it is left with the soil; but as this final term of existence is, in no wise, intended to be reached at the barn-yard, we may here freely dispense with its consequences as no subject for discussion in this place. All that we desire, for the present, to arrive at, is a knowledge of the changes which stable manure undergoes by putrefaction at the barn yard, or within a certain period of time previous to its being applied to the soil. The peculiarities of these changes will best become apparent by a simple com-