ment; 4.5 C.C. of Ammonium Chloride were required to give the proper color; then $4.5 \times \frac{1}{100} \times .01 \times 4 = 0.2214$ milligrammes of free ammonia per litre.

The free Ammonia or Saline Ammonia is the Ammonia combined with Carbonic, Nitric or other acid, and also what may be derived from any easily decomposable substance such as urea. The quantity should not exceed .02 milligrammes per litre in good water.

Having calculated the free ammonia, the residue of the water in the retort is used to determine the nitrogenous organic matter as measured by albuminoid ammonia. The nitrogen is converted into ammonia by means of potassium permanganate in presence of an alkali; the ammonia is then distilled off and estimated as above.

Dissolve 8 grammes of permanganate of potassium, and 200 grammes of solid caustic potash, in one litre of water; boil thoroughly to drive off any ammonia and destroy any nitrogenous matter. This is known as Wanklyn's Solution. Add to the residue in the retort 25 C.C. of this solution; distil over 110 to 120. Calculate the ammonia as before and state the results in this case as ALBUMINOID AMMONIA.

The standard limit of Albuminoid Ammonia in good water is stated by Wanklyn to be .05 milligrammes per litre; some other authorities place it at .08. Much albuminoid ammonia, little free ammonia and almost entire absence of chlorides, is, according to Wanklyn, indicative of vegetable contamination.

OXIDISABLE MATTER.

The chief sources of oxidisable matter in water are oxidisable organic matter, and nitrous acid as nitrates. The estimation of these affords valuable evidence of the character of a water, and are conveniently determined by means of permanganate of potassium.

We calculate: 1. TOTAL OXIDISABLE MATTER in terms of oxygen required for its OXIDATION. Make a solution of permanganate by dissolving .395 grammes of the crystallized salt in one litre of water. Each C.C. of this solution yields 0.1 milligramme of oxygen in presence of an acid. Test its accuracy by a solution of crystallized oxalic acid of the strength of .7875 grammes to the litre of water. This solution, acidulated with dilute sulphuric acid, should exactly decolorize an equal quantity of solution of permanganate.

The process, as recommended by Woods, is as follows:

"Take a convenient quantity of the water to be examined, say 250 C.C.; add 5 C.C. of dilute sulphuric acid (1 to 10); drop in the permanganate solution from a burette, until a pink colour is established; warm the water up to 140° F., dropping in more permanganate if the color disappears; when the temperature reaches 140, remove the lamp; continue to drop in the permanganate till the color is permanent for about ten minutes. Then read off the number of C.C., and multiply by 0.1, to get the milligrammes of Oxygen, and by 4 to get the amount per litre." The amount of oxygen obtained by this process includes that from organic matter and nitrous acid. To separate these we must drive off the nitrous acid by boiling with sulphuric acid as follows:

Take 250 C.C. of the water under examination; add 5 C.C. of dilute sulphuric acid, as before; boil briskly for 20 minutes, then allow it to cool down to 140° F.; add the permanganate solution until a pink color remains for ten minutes; then calculate as before. The result in this case must be stated as milligrammes per litre of oxidisable organic matter, or ORGANIC OXYGEN.

NITROUS ACID is now easily determined, for it is represented by the difference between the two preceding processes. Each milligramme of oxygen is equivalent to 2.875 milligrammes of nitrous acid, the difference must, therefore, be multiplied by this factor, and the result is nitrous acid in milligrammes per litre.

From the foregoing tests we can gain sufficient evidence to form an opinion of the character of a given sample of water. The inference from this evidence can be drawn as follows:

A large quantity of nitric and nitrous acids, much oxidisable and nitrogenous organic matter, with much chlorine, indicates recent sewage impregnation. With little oxidisable organic matter, and nitric acid in large amount, we