

per gallon is fairly good.

Magnesia.—Magnesia is of somewhat rare occurrence in water, but in some localities it may be met with in considerable quantities. A quantity of water should be evaporated in a small porcelain basin, over the spirit lamp to one-fiftieth of its volume. To this taken in a test-tube, ammonium oxalate is added and filtered to remove any lime. The resulting filtrate should be treated with a few drops each of the solutions of sodium phosphate, ammonium chloride and ammonia solution. If any magnesia be present a crystalline precipitate will be observed after the liquor is allowed to rest for twenty-four hours.

Iron.—The presence of iron is indicated by a blue precipitate on the addition of potassium ferrocyanide.

Lead.—Place some water in a white dish and stir up with a rod dipped in ammonium sulphide, a dark colour not disappearing on the addition of a few drops of hydrochloric acid will be produced.

Copper also presents the reaction, but the presence of lead or copper may be distinguished by adding a few drops of sulphuric acid and filtering the water before it is tested. If a slight cloudiness is observed on the addition of sulphuric acid it indicates lead, and if the solution tested after filtering gives the dark colour described above it indicates copper.

Zinc is rarely found except as an impurity in connection with a storage cistern. A white precipitate on the addition of sulphuretted hydrogen indicates its presence.

Chlorine.—The addition of a few drops of nitric acid and silver nitrate produces a mere haze if chlorine is present to the extent of a grain per gallon; four grains give a marked turbidity and ten grains a considerable precipitate. The presence of chlorine in water indicates impurities from dissolved mineral chlorides or urine and sewage.

Sulphuric acid.—On the addition of barium chloride a grain and a half of sulphuric acid per gallon of water would give a precipitate after a while, three grains would give an immediate haze. The presence of this impurity indicates mineral sulphates such as those of lime and sodium. The presence of the former deteriorates the quality of water for industrial purposes greatly.

Phosphoric acid.—Concentrate a quantity of water by evaporation and the addition of molybdate of ammonium and nitric acid followed by a slight heating and allowing the solution to stand for a while, would give a yellow colour if phosphoric acid be present. The presence of this substance indicates animal and vegetable impurities in the water.

Nitric acid.—Add a solution of brucine to the water to be tested, and pour strong sulphuric acid; if nitric acid be present a red-coloured zone forms at the margin of the sulphuric acid and water. Instead of brucine, sulphate of iron may be substituted when the colour of the zone will be brown;—nitric acid indicates mineral as well as organic impurities.

Ammonia.—On the addition of two or three drops of Nessler's reagent to about one-fourth of a test-tube full of water, and examining the tube over a white piece of paper, a yellow colour is seen, indicating the presence of ammonia. Small quantities give only a slight tint, but even then

the water is suspicious, and may be contaminated with urine, sewage and other organic impurities.

Organic matter is best observed by evaporating to dryness a quantity of water in a porcelain basin and heating the residue, which, if it blackens, indicate the presence of organic matter.

We next come to the third method of testing, *i.e.*, for hardness. Water is said to be hard when it contains dissolved matter in it, but as a rule the term "hard" is used to denote the presence of either carbonate of lime (chalk) or sulphate of lime (gypsum). The hardness due to the presence of chalk is removable either by boiling or by the addition of lime-water, and is hence known as "removable hardness," whereas water containing gypsum is known as permanently hard.

Hardness.—There are various elaborate processes of determining the degrees of hardness of water, and these, of course, give very accurate results but demand care and labour which no one but a professional chemist could bestow. For ordinary purposes the following method may prove serviceable. Instead of the "soap test" we substitute "soap liniment" prepared according in the British Pharmacopia strength, which any druggist would supply. The test consists in the quantity of the soap solution necessary to form a lather in the water. If one drop of soap solution put in half an ounce of water forms a lather, we conclude that the water contains less than one-and-a-half grains of lime per gallon, and an additional drop of the soap solution represents an additional one-and-a-half grains. The number of grains represents the degree of hardness; for example, if half an ounce of water requires four drops of the soap solution, it indicates six degrees of hardness. In order to find the amount of permanent hardness, a quantity of boiled water should be treated in the same way, and the result will indicate the permanent hardness. The difference between total and permanent hardness will give the degree of removable hardness. The permanent hardness of good water should not be above 3 or 4 degrees.

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GENERAL ITEMS.

A London physician not long ago published an interesting paper in the *Lancet* on the use of fruits in the relief of diseased conditions of the body. Under the category of laxatives, oranges, figs, tamarinds, prunes, mulberries, dates, nectarines and plums may be included. Pomegranates, cranberries, blackberries, raspberries, barberries, quinces, pears, wild cherries and medlars are astringent; grapes, peaches, strawberries, whortleberries, prickly pears, black currants and melon seeds are diuretics; gooseberries, red and white currants, pumpkins and melons are refrigerants and stomachic sedatives. Taken in the early morning an orange acts very decidedly as a laxative, sometimes amounting to a purgative, and may generally be relied on. Figs, slit open, form excellent poultices for boils and small abscesses. Strawberries and lemons, locally applied, are of some service in the removal of tartar from teeth. Apples are correctives, useful in nausea, and even seasickness and the vomiting of pregnancy. The oil of the coconut has been recommended as a substitute

for cod liver oil, and is much used in Germany for phthisis. Grapes and raisins are very nutritive and demulcent, and very grateful in the sick chamber.

The Editor of the Cape of Good Hope Journal of Agriculture writes:—"At the Illinois Experiment Station experiments have been made to secure still further beneficial results. The object of these experiments was to discover whether the excrescences which naturally form on the roots of clover, peas, and other leguminous plants, and which enables such plants to decompose the atmosphere and use its nitrogen, may not be also made to grow on corn, oats, and other plants of the grass family. If this can be accomplished it will be possible to make corn, oats, and wheat renovating crops, as clover and peas now are." The experiment with maize is reported to be partially successful, but we have to await still further trials. We need scarcely say that this method of furnishing

growing crops and the soil with one of the most important elements of plant food, will be, if successful and of easy application, a most important step in agricultural progress."

The following interesting note with reference to the cow-pea which is now growing satisfactorily at the Colombo School of Agriculture, appears in the *American Agriculturist*:—"The cow pea has become established in Queensland, and is extremely and deservedly popular. The original seed was sent from the United States and distributed by Professor Shelton among the sugar planters. The Professor says:—"From this insignificant beginning the cow-pea has spread the whole length of the Queensland coast. Indeed, one sees it now on every plantation and nearly every holding in the interior, as well as along the coast. Often areas of fifty to one hundred acres may be seen under cultivation with this great crop. It is everywhere pronounced to be invaluable, furnishing these hungry, washed-out soils with the nitrogen needed for the subsequent crop of cane."

