pressed; if, for example, it point to 2, it shows that the substance weighs 2lbs. The urinometer has been made in a similar way; it floats in urine and shows by the mark to which it sinks, how much heavier than water the specimen is in which it is floating.

There is a natural law that any substance floating in a liquid displaces its own weight of liquid and no more.

In weighing urine the standard of comparison has been fixed at 1,000 to avoid decimal numbers. The normal number is said to be about 1,020 and the urinometer is marked accordingly. The bulb and buoyant part represent 1,000, or the pure water with which the urine is to be compared; the figures up the shank of the urinometer, 5, 10, 20, &c., to which in different specimens of urine the instrument will sink, indicate the different density or weight of the urine. The actual difference of weight between water and urine is so small that if the same quantity of each were placed in ordinary scales there would be scarcely a perceptible difference; it is only with the delicately made urinometer that this difference can be accurately weighed; thus, if it sink to 1,020 (remember that the bulb and buoyant part represent 1,000) it shows that the urine weighs $\frac{20}{1000}$, that is $\frac{1}{50}$ heavier than water, and is in a normal condition*; if it sink to 1,050 it shows that the specimen weighs $\frac{50}{1000}=\frac{1}{20}$ heavier than water, and consequently contains more substance in solution than is consistent with health; so, on the other hand, if it only sink to 1,004 it shows that the specimen weighs only $\frac{4}{1000}=\frac{1}{250}$ heavier than water, and consequently contains very little substance in solution, showing that the urine is not carrying away a sufficient quantity of used up tissue.

To make this clearer we might take a large vessel of pure water and measure off a certain quantity and weigh it; add salt to the water in the large vessel, allow it to dissolve completely, then measure off the same quantity as before and weigh it; the weight will have increased. Urine is water in which several different substances are dissolved, and consequently like the salted water it weighs heavier than pure water.

Urine consists of urea, uric acid, certain animal products, colouring matter, and certain saline and gaseous substances all held in solution by a large quantity of water. Speaking broadly, it is such a fluid as might be separated from the blood by the help of any kind of filter which had the property of retaining these constituents, and letting the rest flow off. The filter required is found in the kidneys, their minute structure making them perfectly fitted for their work. Now since the quantity of substances dissolved in urine varies according to health or disease, and as it is a sign of disease if the urine be too heavy, that is, if it contain too much substance in solution, or too light, that is, if it do not contain a sufficient amount of substance in solution, it becomes a matter of importance to know how much heavier the urine weighs than water, or, what is the same thing, to find out its specific gravity. When this has been done further tests are applied to discover what is the particular substance that is making the urine too heavy, or, on the other hand, what of the constituent parts of urine are wanting to it, thus helping the physician to arrive at a correct decision about the disease of the patient, and the part diseased.

Sugar, or albumen may be suspected when the specific gravity rises far above 1,020, and if it reach 1,040, one or the other is almost sure to be present. In diabetes, when the urine is loaded with sugar the specific gravity may rise to 1,050 or even to 1,060. In albuminuria (urine containing albumen) it may fall to 1,004, showing that the urine is wanting in other constituent parts.

The average quantity of urine passed by an adult in twenty-four hours is fifty ounces. Morning urine is the best for analysis as it represents the simple secretion, being free from recent admixture of food. The specimen to be tested should be carefully covered and kept in a cool place. Urine soon turns alkaline if it is exposed to air, and particularly if it is in an unclean vessel; such urine is valueless to the doctor.

The microscope, as you know, is most useful to doctors for examining urine.

Urine is increased or diminished in quantity as the transpiration from the lungs and skin is abundant or the reverse, as affected by weather, exercise, &c. Its specific gravity may, consistently with health, vary from 1,015 in winter to 1,025 in summer, its specific gravity (weight) being higher when the skin throws off a greater amount of vapour, and lower in cold weather when the urine passed is more in quantity. Urine is generally clear and transparent at first, but as it cools it becomes opaque. It is usually of a pale amber colour; but it may, consistently with health, be nearly colourless, or brownish, or of deep orange tint; it is only when there is disease that urine is turbid when it is expelled.

The acidity or alkaline condition (non-acidity) may be discovered by the use of blue litmus paper, which turns red if the urine be acid; and by red litmus paper, which turns blue if there be a free alkali (a soapy substance) present.

So the "testing of urine" is the process of finding out the precise healthy, unhealthy, or unusual quality in the urine.

The test of heat is usually applied by placing a small quantity of urine in a test tube and subjecting it very carefully to the influence of a spirit-lamp. To detect albumen (like the white of egg) two tests are necessary —heat, and nitric acid, for there are conditions when boiling only is not sufficient to detect albumen; therefore some drops of nitric acid should be added either before or after the urine is boiled.

To test for *bile*, a little urine may be poured on a white plate, and nitric acid added to it drop by drop; if there then be a play of bright colours, bile is present.

Many other tests are used for discovering the presence of phosphates, urates, sugar, pus, blood, &c., &c., but these are more in the doctor's province than in the Nurse's.

Phosphates—phosphoric acid in combination with a base. Phosphates in urine appear as a dense white deposit, especially on boiling; a few drops of nitric acid dissolves them at once.

Urates—a combination of uric or lithic acid with a base; it shows in the urine like cayenne pepper, called gravel in larger collections. Urates, or salts of uric acid, are found in normal urine. Urea is a constituent of urine, by the formation of which the nitrogen of food is eliminated from the body.

* The urine should be cool. See that there are no bubbles round the shank of the urinometer.

previous page next page