

One cup of the colorimeter (right) is half filled with this standard solution used for comparison, which has just been described, and the plunger lowered so that the indicator reads at 10. A varying quantity (depending on the intensity of the color) of the diluted urine is placed in the other cup and the plunger manipulated until the two halves of the field are of an identical intensity of color. The indicator of the left plunger is now read, the fraction, as indicated by the Vernier scale, being taken into account. The estimation of the quantity present is then a question of simple arithmetic.

For instance, the left side reads at 20—the standard being placed at 10. In other words, it takes a column of fluid twice as long to give the same intensity of color as that of the standard, which, of course, shows that the solution contains only half as much dye. To obtain the percentage of dye excreted in the urine compared with the amount in the standard solution used for comparison, it is necessary to multiply the reading of the standard by 100 and divide by the reading indicated for the solution containing the urine. To return to our example, we have $\frac{10 \times 100}{20} = 50$ per cent. as much drug in the urine as in the standard solution used for comparison.

Recently the Helligehaemoglobinometer has been utilized. A standard alkaline solution 6 mg. to a liter is placed in one of the wedge-shaped cups which originally contained the solution for the estimation of the haemoglobin. The urine collected as in the other method is diluted to a liter and a small filtered portion poured into the rectangular cup. The wedge-shaped cup is now manipulated by means of the screw until the two sides of the color field are identical. The per cent on the scale is now noted. The number indicated is subtracted from 100 which gives the per cent. of phthalien excreted. This instrument is much cheaper than the Duboscq and approximately accurate (7).

When the urine collected has been made strongly alkaline, it is necessary to estimate the phthalein within a few hours as the red color fades gradually under these conditions. When it is desirable or necessary to defer the estimation for some hours or days, it is better to make the urine distinctly acid, under which condition the phthalein remains unchanged. It should, of course, be made alkaline again when the estimation is made.

EXCRETION IN NORMAL INDIVIDUALS.

The excretion has been studied in several hundred normal individuals. In our earlier work subcutaneous administration was used exclusively, the drug appearing in the urine in from 5 to 11 minutes, 40