

addition of ammonia gives a further precipitate of quinine, and this will continue until at last often more than twice the volume of ammoniacal solution has been added that was added at first. In one case further addition of ammonia to ferro-quinic citrate solution, after the latter already turned red litmus paper dipped into it distinctly blue, precipitated an additional 4.6 per cent., and in another case an additional 3 per cent. of quinine.

The method of estimating "*Ferri et Quiniæ Citras*" recommended in the pharmacopœia cannot be said to be at all satisfactory. If the indications of litmus paper be alone attended to, the "slight excess of ammonia" there prescribed may be, as we have seen, *too slight* to precipitate all the quinine present. We are not told, moreover, whether the precipitate so obtained when collected on the filter is to be washed or not: if washed, some of the quinine will be dissolved out by the wash-water; but, if unwashed, it will retain a very great deal of the solution in which it is precipitated, the ammonium and iron citrates of which will then be reckoned as quinine. In one experiment, the unwashed precipitate obtained from 50 grains of a sample of "*Ferri et Quiniæ Citras*" containing 13 per cent. quinine having been collected on a small filter, and allowed to drain in the funnel for forty-eight hours, was found, after drying, to weigh 8.2 grains; the filtrate (somewhat short of a fluid ounce in volume) yielding to chloroform an additional .4 grain of quinine. Now as only 6.5 grains of quinine were present together, and of this .4 grain was contained in the filtrate, there could have been upon the filter no more than 6.1 grains: 8.2 grains were however indicated, which quantity therefore consisted of 2.1 grains of citrate of iron and ammonium and 6.1 grains of quinine. At another time in the case of a sample containing 14.4 per cent. quinine, when the filter, with the precipitate from 50 grains upon it, instead of being drained in the funnel, was placed upon several folds of blotting paper to remove superfluous moisture, the precipitate was found to weigh 9.5 grains. But since the filtrate contained dissolved .3 grain of quinine, there could not have been upon the filter more than 6.9 grains of the alkaloid, which were therefore here associated with 2.6 grains of foreign substances. Results more nearly approaching accuracy may be obtained by pressing the precipitate repeatedly between folds of blotting paper, and still more nearly by transferring it to a weighed capsule which is then slightly warmed: the quinine will immediately shrink upon itself and set free the greater part (about three-fourths) of the retained solution of the citrates, which may be easily poured off, the residual quinine being then dried and weighed. But our precipitate will not now amount to the 8 grains which the pharmacopœia requires. And it will still fail to represent the quantity of quinine actually present in 50 grains of the sample, since, on the one hand, it will retain even now about  $\frac{1}{4}$  grain or  $\frac{1}{4}$  grain of iron and ammonium citrates, and will be deficient, on