NOTE ON REICHARDS "SILVER" METHOD FOR THE DETERMINATION OF MORPHINE IN OPIUM.

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REICHARD (*Chemiker Zeitung*, xxv., 816, 817) has devised a process for the estimation of morphine in opium, which consists essentially in the determination by weighing of the metallic silver obtained by the reducing action of the alkaloid on an ammoniacal silver chloride solution. According to Reichard, morphine is the only one of the opium alkaloids which—at any rate, under the conditions of his process—exercises a reducing action on a silver solution. Reichard further states that, if other reducing substances be present in the opium, their influence can be eliminated by precipitating the "alkaloids (morphia)" (*sic*) with ammonia, filtering, treating the filtrate with ammoniacal silver chloride, weighing the reduced silver, and subtracting the weight so obtained from the gross amount. Reichard, however, states that after precipitation with ammonia he was never able to observe any reduction. Neither of these assertions bears the stamp of probability, but, owing to lack of time, I was not able to enter into this aspect of the question, but confined myself to a practical trial of the method. I found, in the first place, that if Reichard's instructions were literally followed, it was, owing to the formation of colloidal silver, practically impossible to satisfactorily wash the precipitated silver; but this difficulty was overcome by employing a 20 per cent. solution of chloride of ammonium (with the addition of a little ammonia) as wash liquor. Contrary to Reichard's experience, I found that, after precipitation with ammonia and filtration, the filtrate exercised a strong reducing action on the reagent prescribed, and here also it was necessary to make use of a liberal amount of ammonium chloride (added to the liquor before filtration) in order efficiently to filter and wash the precipitate. The sample worked on was a good average Persian opium, which had been repeatedly analysed by several of the more reliable methods, and which gave (as an average of three methods) 10·98 *per cent.* morphine. At first I worked on 5 grammes of opium, but found that the quantity of silver precipitated was too large to be conveniently handled, and the results given below were all obtained by operating on 2 grammes of the drug. The ammoniacal silver solution used contained roughly 5 per cent. AgCl, and 5 c.c. should, therefore, have (according to Reichard) been amply sufficient for a complete precipitation. The results obtained by the direct method were as follows (Table I.):

TABLE I.
(Two Grammes of Opium.)

No. of Experiment.	No. of c.c. Silver Solution.	Weight of Precipitated Silver.	= Morphine per cent.
1	5	0·15049	10·54
2	7	0·21189	14·85
3	8	0·25369	17·77
4	16	0·39609	27·75
5	30	0·29929	20·98

TABLE II.

(Results AFTER Precipitation with Ammonia.)

No. of Experiment.	No. of c.c. Silver Solution.	Weight of Precipitated Silver.
6	5	0.1459
7	10	0.2591
8	20	0.2189

Up to a certain point, therefore, it appears that the quantity of silver reduced is not dependent on the morphine contents, but rather on the quantity of silver solution employed. It is curious that in both series a very large excess of silver solution gives *lower* results than those obtained by a more moderate addition. It is obvious that in its present form, at any rate, the method is quite useless.