

DISCUSSION.

Professor R. Abegg (*communicated*) said he had nothing to add to the Paper, but he would like to offer the author his sincere congratulations on his extremely interesting and valuable results, which gave at last a quantitative basis to what had long been a merely qualitative treatment of an important analytical reaction.

Dr. F. Mollwo Perkin referred to the bearing of the Paper on analytical problems. It was well known in analytical chemistry that a large excess of sodium or ammonium sulphide should not be employed

when dissolving out the sulphides of the arsenic group, owing to the tendency for the sulphides of copper and mercury to go into solution. Dr. Knox, in his Paper, shows from physical considerations what that solubility is. With reference to the relative solubility of red and black mercuric sulphide, the author shows the red to be the stable modification. This is, of course, only what was to be expected, seeing that on leaving the black modification in contact with a little sodium sulphide and free alkali in a short time complete transformation into the red modification takes place.

Dr. V. H. Veley endorsed what the Chairman had said regarding the points of considerable interest presented by the Paper in connection with the precipitation of the heavy metals by hydrogen sulphide.

With regard to the best conditions of acidity for the precipitation of sulphides mentioned in the paper (p. 46, par. 7), it was very usual in practice to make the solution far too acid.

Physico-chemical Papers, like that of the author, certainly helped one to understand and carry out even the ordinary routine work of the laboratory; only those who knew the difficulties of manipulation in sulphide precipitations, for example, could really appreciate this fact.

Dr. G. Senter asked whether Dr. Knox, in the course of his solubility determinations with sulphides, had experienced any difficulty in attaining the same equilibrium point from both sides. It was well known, and had been shown again quite recently by Gliselli (*Abstracts Chem. Society*, 1907, ii. 868) for zinc sulphide, that "false equilibria" are very frequent in sulphide solutions.

Dr. A. C. Cumming pointed out that on page 44 of the paper a case such as was spoken of by Dr. Senter was referred to.

Dr. J. Knox (*communicated reply*): The figures given for the concentrations of the different ions in various sulphide solutions, referred to by Dr. Veley, are not intended to represent the best conditions for sulphide precipitation, but merely to indicate approximately the relations between the concentrations of the ions in average cases. The best conditions for precipitation will, of course, be different for different sulphides. In reply to Dr. Senter, I may say that no indication of "false equilibrium" was obtained, and that in the several cases tried the same equilibrium point was reached from both sides.