**NOTES FROM THE RESEARCH LABORATORY,
EASTMAN KODAK COMPANY.***

**THE IODIDE TITRATION OF SILVER NITRATE WITH
PALLADIOUS NITRATE AS THE INDICATOR.¹**

By Louis Schneider.

[ABSTRACT.]

THIS new method is especially adapted for the determination of very small amounts of silver with accuracy, and overcomes the effect of those metals that usually interfere with the Volhard method. The method consists of the titration of silver nitrate with potassium iodide in the presence of a very small amount of palladious nitrate. The silver nitrate is precipitated by the potassium iodide and the slightest excess of potassium iodide is converted by the palladious nitrate to palladious iodide which is strongly colored.

In applying the palladium indicator it was found necessary to employ a protective colloid, such as gum arabic to prevent the occlusion of silver nitrate or potassium iodide in tenth normal titrations, and, in very dilute solutions, in order to obtain a precise colorimetric comparison in determining the end point.

The errors of the method are discussed and may be avoided by adherence to the recommended method of procedure. An accuracy of 0.1 per cent. is easily obtained.

**A NEW METHOD OF OBTAINING DYE TONED IMAGES BY
THE USE OF COPPER FERROCYANIDE AS A MORDANT.²**

By J. I. Crabtree.

[ABSTRACT.]

As a result of a search for mordants of basic dyes other than silver iodide, it was found that by replacing more or less

* Communicated by the Director.

¹ Communication No. 59 from the Research Laboratory of the Eastman Kodak Company, published in *Journal American Chemical Society*, April, 1918, p. 583.

² Communication No. 72 from the Research Laboratory of the Eastman Kodak Company, published in *Phot. J. Am.*, 1918, p. 338; *Mot. Pic. News*, Aug. 17, 1918, p. 1104, and Aug. 24, p. 1278.

of a silver image by copper ferrocyanide, by toning in the usual copper-toning bath, washing, and then immersing in an acid solution of a basic dye, dye-toned images were obtained.

The usual copper toning bath consists of a solution of copper ferricyanide dissolved in a suitable solvent, such as a solution of an alkaline salt, of citric, tartaric, or oxalic acid, together with other salts. On immersing the silver image in such a bath the silver reacts with the copper ferricyanide and is converted to silver ferrocyanide, while copper ferrocyanide is formed simultaneously in combination with the image.

On immersing this image in a solution of a suitable basic dye a composite image is obtained consisting of a mixture of silver, silver ferrocyanide, copper ferrocyanide and the dye, so that the color of the toned image produced is of a color intermediate between that of the dye and the copper compound, depending on the relative proportion of each. The amount of copper salt necessary to mordant the dye is usually so small that the resultant tone differs but slightly from that of the dye itself. After toning in the copper-toning bath for a few minutes the positive is washed for ten minutes and immersed in the dye solution, which contains a little acid. After dyeing only a mere rinse of water is necessary before drying.

If the highlights are stained, the positive should be washed for five or ten minutes or until clear. Stained highlights are caused either by insufficient washing after toning, too strong a dye bath, or an incorrect amount of acid in the dye bath.

Satisfactory tones may be secured with the following dyes: Tannin Heliotrope, Thioflavine, Victoria Green, Methyl Green, Methylene Blue, Chrysoidine, Methyl Violet.

Intermediate dye tones may be obtained by mixing two or more dyes, and pale tones by giving a short bath in the copper solution and fully dyeing, or by toning for a longer time and giving a short immersion in the dye bath.

A feature of the toned images produced in the above manner is their transparency. The transparency depends on the composition of the copper toning bath and on the fineness of grain of the silver image to be toned. For toning lantern slides the best results are obtained on the "slow" variety of plates, which are usually of fine grain.