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TONING EXPERIMENTS.—BLACK TONES.

The theory of alkaline gold toning remains but very imperfectly understood. Whether it simply consists of a deposition of gold on the surface of the print, or is the result of a substitution process, an atom of gold taking the place of an atom of silver; whether the solution should be just rendered neutral, left faintly acid, or decidedly alkaline; what is the change which is produced by age on solution of gold and some neutral salts; what is the cause of the variety in tint produced by the different agents used in neutralizing or decomposing the chloride of gold—these and some other important questions, depending for their solution upon a satisfactory knowledge of the theory of the process, must remain undecided until the subject is better understood. We shall probably have something to say on the theory shortly. In the meantime we have a few more words to say on the practice.

It seems to be pretty generally acknowledged that the base of the neutral or alkaline salt added to the chloride of gold does influence the colour of the resulting picture. Whether by regulating the degree of subdivision and size of the particles in which the gold is deposited, or by influencing its mode of combining with the particles of silver in the image; or in some other way, seems to be undecided. But the fact seems to be as generally acknowledged as that the acid in the developer affects the colour of the negative. The acetate of soda and citrate of soda tend to give purple tones; purple-brown if the print be lightly toned, purple-black if the print be deeply toned. The carbonate, phosphate, and bichlorate of soda have each slightly different effects, more running on the sepia tints. The presence of salts of lime seems to aid in producing pure neutral blacks, such as are familiarly known amongst English portraitists as the French tones. Which class of tones is considered best must depend largely on taste, but as a rule the public demand the black tones, and professional portraitists are therefore fain to produce them, and it is on the production of these tones we now offer a few hints.

We have recently been much interested, during a visit to the Isle of Wight, by examining the results of a very extensive and systematically conducted series of experiments in toning, chiefly conducted with a view to the production of pure black tones, without any red or brown tint on the one hand, or any blue, grey, or slaty tint on the other. These experiments had been conducted in the printing establishment of Mr. Jabez Hughes,* and under his direction, by his son, Mr. Alfred Hughes, and an assistant, Mr. Winterbourne. A general course of operations having been prescribed, each assistant carried out his own experiments independently and without any consultation as to details, or comparison of results until each series was completed. As every photographer knows, a certain formula may work well with a certain sample of paper, but gives

* We may here remark that the experiments in question were undertaken with the express view of obtaining trustworthy formulæ for a new edition of Mr. Hughes' Manual, shortly to be published.

worthless results with another. In these experiments, therefore, a great variety of papers of different qualities, and prepared by different houses, were used, in order that a formula of most universal application, and one which seemed least deranged in its operations by accidental varieties in the paper, might be obtained. The results aimed at were a pure black tone, freedom from mealiness, very little bleaching or reduction in the depth of the print, uniform results on different papers, and a solution which, whilst it would tone soon after mixing, would also keep.

In one series of experiments seventeen different solutions were tried, and ten different samples of paper. In the other series thirteen solutions, and ten samples of paper. Without entering into a precise detail of some hundreds of experiments, we may state broadly their direction, and generalize the results.

Carbonate of soda added to a gold solution in sufficient quantity to neutralize any free acid, nor even in quantity equivalent to the amount of chlorine in the salt of gold, did not, according to expectation, produce a satisfactory toning solution, mealiness being a common result, until at least ten grains of bi-carbonate of soda were added to each grain of chloride of gold, even when the aid of heat was called in to facilitate the necessary reactions, prior to immersing prints. The tones given when carbonate of soda and gold only were present were invariably different tints of brown. The addition of chloride of lime, however, effected a great change and improvement in the character of the solution, black tones were obtained and more regular action. A solution made with from ten to fifteen grains of carbonate of soda, and three grains of chloride of lime to one grain of chloride of gold, in six or eight ounces of hot water, gave very good results. Its keeping qualities were uncertain, but a somewhat remarkable fact was observed, namely, gold solutions containing carbonate of soda, which generally decomposed, became stable when chloride of lime was added.

Chloride of lime alone with the chloride of gold, in any proportion, was found to be unsatisfactory, giving mealy prints when used at once, and not getting into working condition with any amount of keeping which had been tried.

Carbonate of lime and gold alone were not found satisfactory, even when hot water was used. But carbonate of lime, with chloride of lime and gold, gave the best results of all, the toning was moderately rapid, the colour a pure neutral black with warm fleshy half-tones. In this experiment pure carbonate of lime, as sold by the chemist, the same as prepared freshly in the laboratory, by treating common whiting with nitric acid and then precipitating it with carbonate of soda, and also common whiting as sold commercially, were all tried without any perceptible difference in the result. Various proportions were tried, with more or less of success, but the use of excess of the lime salt with hot or boiling water digesting it for about five minutes, and afterwards adding the chloride of lime, was found to be the most efficient method