

How ridiculously simple! Never can work. Now if there was only an addition of some substance that costs a guinea a grain, it might answer; but as it stands—pshaw!

Stop, friend; I have not explained all the wonders connected with this—in my hands—unerring toning solution.

1st. It improves with age. It must after each day's work be returned to a jar, and strengthened always before use by adding gold and a minute trace of salt treated with boiling water as at first. The quantity of gold required is, however, widely different.

To keep at working strength, measure out 4 grains of gold, add a minute trace of fine salt, pour over it about half a pint of boiling water; allow it to stand a bit, add the gold mixture thus prepared to the toning bath, and if you have a batch of ten, twenty, or thirty sheets, place the prints quickly, one by one and face downwards, into the solution. Tone all at one time, remember. Do not hurry yourself; the toning will be regular, and the tones should turn out satisfactorily.

To preserve the solution in good condition I add daily about a pint of plain water, which renders the bath, like Paddy's nether garment, indestructible, although it is being continually renewed after an imperceptible fashion.

The quantities above stated will, perhaps, prove too great for amateurs and photographers with a small business; they may commence with 1 gallon, but, in strengthening afterwards, the proportionate amount of reduction in the amount of gold used must not be made. For 2 grains of gold $\frac{1}{2}$ gallon only of the stock solution must be employed.

In concluding this lengthened article I do not promise success invariable to those who neglect principles; nor can I hold out hopes of a freedom from failure being secured by the inexperienced. I have been closely engaged in photographic printing for years; to that branch of photography I have applied my whole mental powers; yet a week never passes over my head but I observe and note something new. If my mountain seems to some to have produced only a mouse, I would have them remember that little things are only neglected by very little minds. I have seen a cloud no bigger than a man's hand rise from beneath the horizon; I have watched that cloud, and have seen it extend and cover the heavens. A brief instant, and the shrieking blast swept o'er the face of the waters, whose placid surface was at once transformed into crested ridges and threatening gulfs; yet all this wild tumult commenced with a small cloud as described. I must now conclude; and my next I purpose devoting to a further consideration of the principles connected with my toning bath, a knowledge of which will tend to secure uniformity of success, considerations which must be regarded as aids to experience. Meantime I shall be glad to receive all enquiries and particulars of experience from those who desire further information. The replies I propose embodying in a special paper devoted to any correspondence I may receive.

PHOTO-ZINCOGRAPHY IN PRACTICE.*

BY J. WATERHOUSE, R.A.

THE PREPARATION OF TRANSFERS IN GREASY INK.

The object in this part of the process is to obtain a positive image in greasy ink on paper, which may be transferred to a zinc plate or lithographic stone, and printed off in the ordinary way.

The rationale of carbon processes in general is now well known, and depends on the property possessed by the alkaline bichromates of rendering gelatine, gum, albumen, &c., insoluble under the influence of light. If we coat a piece of paper with a mixture of bichromate and gelatine to which some pigment has been added, and expose it to light under a negative, we shall find on washing it in water that the parts acted on by light have remained insoluble, forming a

* Continued from p. 295.

positive image in pigment, while the unexposed parts, which retained their solubility, have been washed away, leaving the paper perfectly clear. The effect is the same if the paper be coated after exposure with a thin layer of greasy ink, and then washed; and this simple fact is the foundation of all the photo-lithographic processes.

The first thing to consider is the paper, the quality of which is of importance. The paper found to answer best for this process is that known as bank post; it is made from linen, and, being hard and tough, stands the washing well. A medium thickness should be chosen; if it is too thin it is liable to tear, and if too thick, too much of the solution is absorbed. If bank post paper cannot be obtained, ordinary Rive paper will answer.

PREPARATION OF THE SENSITIVE PAPER.

There are two ways of preparing the sensitive paper: either by floating it on a warm mixture of bichromate of potash and gelatine, or by immersing paper previously coated with gelatine in a cold solution of bichromate of potash.

I prefer the latter plan, especially for amateurs. A quantity of the paper may be prepared with gelatine at any time, and one operation only is required for the sensitizing, which may be done in the evening, and the paper will be found dry and fit for use in the morning.

The proportions of the bichromate and gelatine are influenced by several considerations. The bichromate should not be more than sufficient to render the gelatine wholly insoluble under the influence of light; excess of bichromate produces crystallization on the surface of the paper, and rapidly causes the spontaneous decomposition of the gelatine without the aid of light. In India, so rapid was the decomposition under the combined influence of great heat and moisture, that the proportion of bichromate was sometimes reduced so low as 3 drachms to 40 ounces of the gelatine mixture, but with a corresponding loss of sensitiveness.

The coating of gelatine must not be too thick, or the finer lines will not be impressed through the coating, and will be washed away in the after operations, and when damping the transfers before transferring to zinc, it will be found that the gelatine under the lines will soften by absorbing too much moisture, and will be liable to spread on the plate. On the other hand, the coating must not be too thin; otherwise, when the paper is inked in the press, the ink will be forced into the substance of the paper, and the ground will be irremediably stained. I have obtained sharper results by using a moderate thickness of gelatine than with a thin coating. The quality of the gelatine is important. The ordinary cooking gelatine is not suitable; Nelson's patent fine cut is the best. The French gelatine, sold in thin transparent sheets, will answer, and so will the substance sold under the name of Russian glue, at a much less price than gelatine.

For the preparation of the paper, a metal hot water dish will be found useful. It should be similar in form to the trays used for waxing paper in the days of the waxed paper process. The upper tray should be made of zinc or enamelled iron, and should fit into a metal box one inch larger every way, supported on iron legs, so that heat might be applied by means of a spirit lamp or gas jet, &c., so as to keep the temperature of the solution at about 100°.

I will now describe the details of both methods of sensitizing. The proportions given below will be found to answer well for general purposes.

The formula for the mixed sensitizing solution is,—

Bichromate potash	...	...	...	2 ounces
Nelson's gelatine	...	...	...	3 "
Water	...	...	...	50 "

The bichromate is dissolved in 10 ounces of hot water and added to the gelatine dissolved in 40 ounces of water; the mixture is then strained through flannel into a flat dish placed in another containing warm water. The paper is care-