

resemblance in features and obedience to the laws of drawing lofty enough to banish for ever the monstrosities of family portraits which abused the hospitality of respectable middle-class dining-rooms. In landscape art it has compelled painters to respect the veracity of nature, which formerly all but the greatest defied with effrontery. If it is a reproach to many excellent landscapes that they approach too closely to photographs, exhibitions of landscape art owe it to photography that few among the inferior works in them bear no trace of having been copied from nature at all. Like most of the powerful agencies in modern life, photography is a leveller. It tends to render the eye content in art with something below the inspirations of genius. On the other hand, it will not suffer daubs and scarecrows to placard themselves as creations of art with impunity. Since the world in the nature of things cannot afford to indulge freely in masterpieces, photography, which has relieved it from dependence for its artistic adornment on engravings without taste, and paintings out of drawing, deserves to be hailed as a public benefactor.

PHOTO-LITHOGRAPHY AND PHOTO-ZINCOGRAPHY.

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CHAPTER XII.—DIRECT COLLO-CHROMATE METHODS.

In the direct methods of photo-lithography, as we have already noticed in Chapter V., the photographic image is produced directly by the action of light on a lithographic stone or a metal plate coated with a sensitive collo-chromate mixture, or with bitumen. The collo-chromate methods are better adapted for working on stone than on metal, for which latter bitumen is preferable, and have advantages over the transfer methods in simplicity, economy of material, rapidity of working, and accuracy of scale; but, on the other hand, the inconveniences of working with heavy stones, the difficulty of obtaining perfect contact between the negative and the stone, and, more than all, the liability of the image to wear out quickly in printing, have caused these methods to be almost entirely abandoned in favour of the transfer methods, which, notwithstanding the disadvantages they labour under of distorting the dimensions of the images, and the comparative heaviness of the results, have many conveniences, and are very suitable for all ordinary work in line. In cases where the use of direct methods is desirable, such as for the reproduction of very fine line-work or for half-tone, it is preferable to employ the colotype process, which gives very superior results, both in line and half-tone.

In the earlier direct processes of photo-lithography, bitumen was the sensitive substance used for coating the stones; but it is now, I believe, very seldom used with stone, though of late years it has again come into extensive use with zinc plates for the production of blocks for printing with letter-press.

Although the direct collo-chromate methods are very little used at present, these papers would be incomplete without some record of them; and, moreover, they have a good deal of interest attaching to them as being the starting point of most of the present processes of photo-lithography and colotype. The bitumen methods will be treated by themselves in another chapter.

The first person to apply a mixture of an alkaline bichromate with a colloid to a lithographic stone, with the object of obtaining impressions in greasy ink therefrom, was Poitevin, who elaborated a very practical method for reproducing subjects both in line and half-tone. It is doubtful whether he or Paul Pretsch was the actual discoverer of the property possessed by an insolated and damped collo-chromate film of taking up greasy ink in the parts acted on by light, and this proportionately to the amount of the action of light upon them; but he certainly was the first to apply this principle in a practical way to lithographic printing, and the processes of this kind still used are almost identical with Poitevin's own way of working as described in his *Traité*

des Impressions Photographiques, of which a new edition, with appendices by M. Leon Vidal, has just been published, and from which I take the liberty of quoting.

Poitevin says:—"A hard and close-grained Bavarian lithographic stone is to be preferred. The surface being smoothed and finely grained, I wet it, and having removed the excess of water, I apply with a brush the bichromate mixture, composed of an egg beaten up, passed through a piece of linen, and mixed with an equal quantity of saturated solution of bichromate of ammonia. With a sponge I clean the edges of the stone, and with a linen dabber I remove the excess of solution by dabbing, but without rubbing, and with a drier cloth I remove the remainder of the liquid in the same way until the stone no longer moistens the finger when touched. By working thus, only a very small quantity of the bichromated mixture penetrates into the stone, and forms there a very regular inner layer without covering its surface. Without waiting for the complete drying of this layer, I apply to it the photographic *cliché*, if of paper, by keeping it in place by means of a glass plate fastened down by means of pellets of soft modelling wax. If the negative is on glass, I fix it with wax. I have also used a special pressure-frame to hold the stone and negative; but the way I have described answers ordinarily. I expose the prepared stone either to direct sunlight, falling perpendicularly on its surface, or to diffused light, laying the stone horizontally. The time of exposure is very variable in summer (from ten to twelve minutes in the sun), and in winter from an hour and a-half to two hours; in the shade the exposure will be from four to five times longer. In any case the latitude is great, and it is better to expose too much than too little, because over-exposure can be corrected in the inking of the stone, and by the etching and proving, whilst too little exposure prevents the greasy ink from adhering to the half-tones, and that cannot be remedied.

"After exposure to light, the stone is taken into the inking room and there left for some time to take the temperature of the surrounding air, whether it may have been too much warmed or chilled according to the temperature of the time of year.

"The stone is moistened with a sponge dipped in a solution containing one-third of glycerine to two-thirds of water, and having removed the excess of liquid, I pass a roller charged with transfer ink and varnish all over the stone. The image then appears gradually, the parts which have received the action of light retaining the fatty ink, whilst the others, corresponding to the whites of the drawing or opaque parts of the negatives, repel it. The stone is damped lightly with ordinary water, and the inking is continued until the drawing has attained the desired strength. If the stone should have been over-inked, the whole is removed with turpentine, the stone is wiped and damped, and the inking-in is done again more carefully, with the roller less charged with ink.

"The stone is then left at rest for about twelve hours, in order that the fatty ink may penetrate it and be fixed more completely. It is then gummed; after an hour it is washed, the gum removed, and the stone is then rolled in with ordinary printing ink, etched and proved by pulling a few proofs, just as in the case of an ordinary chalk drawing on stone.

"If the exposure to light has been insufficient, the fatty ink will take with difficulty, and the proof will be wanting in half-tone; on the contrary, if over-exposed, the image will be heavy and blocked up; but in the majority of cases a good proof is obtained, because there is a great latitude in the exposure if the lithographer is skilful in working up the image. In any case it will always be better to expose a fresh stone rather than hand over a bad impression to the printer."

Writing near the close of his life, Poitevin notices the improvements brought about by the adoption of a coating of bichromated gelatine supported on metal or glass plates;