

The principle, then, upon which the etching is conducted is that No. 1 solution will penetrate and etch the deepest shadows of the picture, which will of course be covered by the thinnest film. No. 2 will attack the plate through that portion of the film which is next thinnest, and so on until No. 5 solution is weak enough to penetrate the thickest film which represents the high lights of the picture, and complete the etching of the plate. It requires some experience to decide exactly how long each solution shall be allowed to work before the plate is transferred to the next weaker, but a good guide is to allow each solution to operate until the darkening of the copper (which is the evidence of the etching) ceases to spread to a thicker portion of the film. When this occurs it is known that the particular solution in use has reached a portion of the film the thickness of which bars its further progress, and the plate should then be transferred to the next solution. Of course you will understand that the action of each solution, after the first, is cumulative, the portions of the plate attacked by No. 1 solution will be also etched by each of the four succeeding solutions, and the action of No. 2 solution, and indeed of each solution, will be continued by each succeeding one. In the dark portions of the picture the danger is that in biting to the necessary depth the bitumen ground may be undermined by the mordant and so the grain be destroyed. This is due to the lateral as well as vertical action of the mordant. The place attacked by it being increased in width as well as in depth. What one really requires is to have a ground abundant in quantity and of a coarser nature in the portions of the picture to be deeply etched, so as to make allowance for part of the grain being lost through the

lateral action of the mordant; but the difficulties of obtaining a ground which shall differ in character in one place from that in another are very great, but it is the one part of the process which is in need of improvement. I may say that for some time past Mr. Wilmer and I have been experimenting with a view to obtaining what I may term a "selective" grain, and our experiments so far have been very encouraging, but they are so far incomplete that I don't feel at liberty to lay them before you on the present occasion. The etching as a rule will take from eight to twelve minutes according to the character of the picture. The times will be something as follows:—

No. 1, one minute.

No. 2, two or three minutes.

No. 3, about three minutes.

No. 4, about two or three minutes;
and

No. 5, until the highest lights of the picture have been discoloured by the mordant and from half a minute to a minute longer.

It is quite impossible to tell beforehand the length of time that the plate will require to remain in a given solution, except No. 1 solution; it depends so very much upon the hygrometric state of the atmosphere at the time and the depth to which the resist has been printed. This is a matter for experience, but with the remarks I have made upon it, and by having regard to the rule as to changing the solution immediately the action of the preceding solution ceases, you should have no difficulty in producing a plate that will yield a print. With regard to solution No. 1 (45°), generally speaking, it is not advisable to allow it to act for more than a minute, otherwise the shadows print too black and the true gradation of the negative is lost.