# ON A PHOTOGRAPHIC PROCESS BY MEANS OF ANILINE BLACK.

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About five years ago I devised a process for the production of positives directly, based upon the production of aniline black in all those parts of a prepared paper which do not receive the light by reason of being shaded by dark portions of a drawing. The process can be used not only for the production of line pictures but is also applicable to the production of pictures which are obtained by a photographic process, i. e., it will produce not only shaded line pictures but also half-shades. As my attention had been drawn to this as a matter of importance I intended to make some experiments in this direction, when I came across some copies of pictures which had been taken about the time when I first produced copies by means of this process and where the originals had been shaded by means of a brush with India ink. These copies confirmed the belief that shades can be reproduced by this process.

I will confine myself here mainly to the description of the process from a chemical point of view, since I have sent to the *Scientific American* during August of this year a detailed description of the manipulations, without, however, touching the chemical questions involved in the process, and describe here the process only in so far as it is necessary for a better understanding.

The paper which is used for this process must be well sized with glue. I found even with the best writing papers too little resistance to the penetrating properties of the acid, sensitive solution, and found it, therefore, invariably best to prepare the paper by covering it with a solution of glue in water (1:50). After the paper has been thus prepared and has again become dry, it is ready to receive the sensitive mixture or solution.

This solution is prepared as follows: one ounce of salt, one

ounce of potassium bichromate, and $\frac{2}{3}$ grains of sodium vanadinate are dissolved in 20 ounces of water. Then a second solution is prepared by pouring 2 ounces of sulphuric acid into 10 ounces of water. After the second solution has cooled both solutions are mixed. This solution is then brought upon the paper, and the paper is dried in a dark room.

The dry paper, or the paper when still slightly damp, is then exposed to light for about 7 minutes, covered with the drawing or picture which is to be copied, in an ordinary copying frame. To ascertain the time which is required for a good copy more accurately, I take a piece of the same paper on which the drawing is and place it over another small piece of the sensitized paper so as to cover it partly, and observe when the shade of the covered part of the paper has become equal to the shade of the fully exposed paper. The influence of insufficient light and of the light-absorbing qualities of the paper are thus overcome.

When this point has been reached, that is, when the covered part of the paper has taken the same shade of color as the uncovered part, the picture is removed from the light and put in the dark until the next process, that of developing the picture, is to be carried out.

From the composition of the solution it is evident that it must be strongly acid. But when this solution is exposed to the light in presence of the organic substances of the paper the acidity of the solution disappears. We obtain potassium and sodium sulphates, basic chromium sulphate, salt and vanadic acid.

While, therefore, the unchanged parts of the paper remain acid, the changed parts acquire a neutral reaction, and while the first will readily assimilate bases the second will not.

If now we expose the paper over an atmosphere laden with water and aniline vapors, the aniline will be absorbed in all those parts where the solution remained acid, and in proportions corresponding to the remaining acidity. The aniline and water (1:50) contained in a flat pan are slightly heated by a Bunsen burner, and the paper on which the picture is to be developed is spread over the opening in a frame placed tightly upon the pan.

One minute's exposure develops the picture so that the color of

lines, etc., appears slightly brown. The paper is then, for the further development of the color, brought into a closet with a temperature of about 24–30° C. and an atmosphere laden with vapors of water, to prevent a drying out of the paper. In the course of about two hours the color is generally sufficiently strong and the picture or copy may be considered finished beyond the fact that the paper itself has been coated with green chromium salt so that the picture is one of black lines upon a green surface. To remove the chromium and to restore the original white of the paper, the copies are then brought into a solution of one part of concentrated ammonia in six parts of water. They are then washed, dried and pressed. The conditions for the development of aniline black are the same as are usually employed if the process is carried out as described. None of the salts given as constituting the sensitive mixtures can be left out. The chromate is necessary for the change of the reaction, the hydrochloric acid of the salt and vanadic acid for the development of the aniline black. The conditions for the development of the black at low temperature require, however, that we must not oversaturate the acids with aniline, for then the formation of the black would be considerably interfered with. For the same reason fine shades in photographic positives may disappear in the copy entirely. I believe, therefore, that the real usefulness of the process lays rather in the reproduction of line drawings in place of the blue print processes now in general use.

The advantage of this process lies in the fact that the lines are almost black, and therefore more distinct to the eye than the blue lines upon white, or the white lines upon blue in the ordinary blue prints.