lodion that is condemned by the portrait photograper because it is over iodized and gives hard pictures is most suited to the purpose.

A negative of an engraving taken with collodion of this description, if sensitized in a slightly acid bath and exposed for a suitable period, should exhibit perfectly clear, transparent lines on an opaque, inky black ground. The exposure should be, if anything, rather too short than too long, for a full exposure, so necessary to the production of an artistic portrait, is fatal to the existence of fine lines in a negative of this kind. Over intensification of the negative must likewise be avoided, as the more delicate lines are easily destroyed by carrying this part of the process too far.

The intensifying solution I would recommend is a developer prepared according to either of the following formulæ :—

No. 1.—Water	20 ounces
Sulphate of iron	1 ounce
Nitrate of potash	½ „
Alcohol	2 ounces
Sulphuric acid	¼ ounce.
No. 2.—Water	10 lbs.
Citric acid	3½ ounces
Sulphate of iron	2 „
Alcohol	6 „

After the picture has been completely developed, the image is intensified by adding a few drops of a 20 per cent. solution of nitrate of silver, the treatment being carried on as long as the fine lines remain visible. After fixing, the plate should be well washed, and then again intensified with a concentrated solution of bichloride of mercury, the treatment with the latter material being repeated as often as may be thought necessary—say from one to four times. With No. 2 solution the subsequent intensifying with bichloride of mercury may sometimes be dispensed with.

The picture to be copied should, if possible, be lighted from the front, direct sun rays falling at an angle of from 50 to 80 degrees, yielding the best illumination; if the sun is higher and the rays fall at an angle of 10 to 30 degrees, shadows are cast by the texture of the paper, and the negative produced presents a rough, mealy appearance, which will be found to be in the highest degree objectionable when an enlargement of the original is prepared.

DETECTION OF HYPOSULPHITE.

BY M. CAREY LEA.*

THE subject of the examination of liquids for traces of hyposulphite of soda has assumed so much interest of late years, that, although the subject has been already well handled, a few more remarks may not be unacceptable.

Having recently had occasion to make some delicate testing in this direction, I tried all the methods usually recommended, submitting each to a rigorous examination upon solutions of hyposulphite made expressly, and of a known strength, and came to the following conclusions :—

Nitrate of Silver has been unduly condemned, for want of using it in the right way. I find it a very useful test when it is boiled with the suspected solution. The liquid to be tested is placed in a test-tube, a small crystal of nitrate of silver is dropped into it, and the solution is boiled. If any hyposulphite be present, the liquid presently turns brown.

It is to be observed that certain organic substances have the same tendency to turn brown a solution of nitrate of silver when boiled with it. To discriminate, drop in a single drop of nitric acid, and boil again. The liquid presently clears up and becomes colourless. Not that the sulphate of silver has dissolved, but has separated. It will be found at the bottom of the test-tube in the form of minute black shining scales. By this test I have been able to detect the presence of one hundred-thousandth of hyposulphite; beyond this the indications cannot be relied on. This test, though delicate, is therefore surpassed by the following (it should be remarked, that when the hyposulphite is present in so small a proportion as one hundred-thousandth, the black scales just mentioned are not visible).

Iodide of Starch.—This reaction is more delicate than the preceding. The best course is that recommended by Dr. Vogel: to use two tubes, and place a piece of white paper behind them, the better to judge of the colour. The following is the method which I employ for preparing and using the iodide of starch :—Place about a quarter of an ounce of water in a test-tube, take up a bit of fine starch, grind it between the finger and thumb, letting the powder fall into the water (half a grain is sufficient); boil till the liquid is clear, and let fall in a single drop of tincture of iodine, agitate well, and let cool. Of this dark blue solution, allow a drop or two to fall into each of two test-tubes, an exactly equal quantity in each, then fill the test-tubes half full, one with distilled water, the other with the liquid to be tested. The colour of the blue should be just perceptible in the tube with common water; if, then, the blue disappears in the other, it is an indication of the presence of hyposulphite. This test is more delicate than the preceding. I obtain indications with one-millionth of hyposulphite, in this result agreeing with Dr. Vogel.

It is to be observed that the great difficulty in removing hyposulphite lies in the fact that photographic paper is sized, and, consequently, very difficult of penetration by fluids. I called attention, some years ago, to the fact that as most photographic paper contains a starch sizing, this affords a ready basis for testing. It is only necessary to draw a brush containing a very weak solution of iodine over a white portion of the paper. If the print is clear of hyposulphite, a blue mark will be produced; if traces of hypo are present, no dark result will follow. It is to be remembered that in using this method it is necessary to have ascertained beforehand, once for all, that the photographic paper in use contains starch, which, of course, is done by applying a little weak iodine solution to the paper before sensitizing. This should be done on the back, not the albuminized side. A blue mark indicates starch, and such paper is then known to be suitable for the application of this test. So far as I remember, this suggestion of mine was the first application of iodide of starch for detecting hyposulphite in photography, though such application was too obvious to be overlooked. Of course, the solution of iodine must be very weak, otherwise one portion of the iodine may destroy the trace of hyposulphite, and the remainder may bring out the blue reaction. This should never be forgotten in employing this test in all its shapes.

This mode of testing is decidedly surpassed by the following :—

Zinc and Sulphuric Acid.—It has been ingeniously proposed to convert the sulphur in the hyposulphite into sulphuric acid, and detect the latter by lead.

Much as has been said of this test, it has scarcely been done justice to. It has every advantage: ease, certainty, and wonderful delicacy. It has the great advantage that, if pure materials be used, there is no possible ambiguity in the result. Other substances, in the first method spoken of, may be browned by silver nitrate; and in the second, other reducing agents may decolourize iodide of starch. But, in the method here under consideration, nothing but a sulphur compound can produce the characteristic reaction with lead.

The liquid to be tested is to be placed in a narrow, deep beaker; a fragment broken off from a stick of pure distilled zinc, which, with a few drops of pure sulphuric acid, is to be dropped into the beaker. It is immediately covered with a piece of Swedish filtering-paper, twisted under the lip of the beaker. The wet stopper of an acetate of lead

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