closed." We cannot even name here the awful consequences upon the health of the unfortunate workers, 80 per cent. of whom were women and children. The agitation by which Lancashire obtained the Cotton Cloths Act will be well remembered. Steaming is now kept within reasonable bounds; but the new law was not secured till it had been discovered that "the problem of weaving heavily sized material without diffusion of dust is a soluble problem." At that time the practice was still steadily increasing. Messrs. Bridges & Holmes reported cases in which there was 2 pounds of size to 1 pound of warp, and said that 100, 120 and 150 per cent. of size was often used, while the proportion of clay to flour had doubled, trebled, and even quadrupled. The limitation of steaming has probably put a stop to this merry expansion, but substantially things have not changed.

So we stand before the less "civilized" races of the earth with an eternal lie upon our lips, making no effort ourselves to keep the law which we are so ready to press against German cutlery and good, sound Australian mutton. What a story will that be of the heroes of trade trickery, when some new Samuel Smiles arises to edify the generations yet to come!

ON THE PREPARATION OF COLLODIO-CHLORIDE PAPER.

By G. H. MOSS.

THE collo-dio-chloride process was first introduced by Wharton Simpson in 1864, and although capable of producing the finest results, it was not much used, many difficulties now removed having to be overcome.

The gelatino-chloride paper coming so much in use has greatly revived the collodion process, which has many great advantages over gelatine.

The formula I use is as follows, and it has been worked out after a long series of most careful experiments, extending over three years:

A.	
Zinc chloride.....	12 gr.
Tartaric acid.....	5 gr.
Citric acid.....	5 gr.

Dissolve in 1½ oz. meth. sulphuric ether.

B.

Silver nitrate 60 gr. Dissolve in 30 minims distilled water by heat; when dissolved add 100 minims pure glycerine and 4 oz. of meth. alcohol, add to this 60 gr. of guncotton, well shake, and then add 1½ oz. ether. When all is dissolved, this should form a grayish-white emulsion of silver in collodion.

The process up to this stage can be manipulated in daylight, but as we are about to form the sensitive emulsion, we must remove to the dark room. I generally make it at night, when the whole process can be done by gaslight.

We now add the A solution, containing the chloride and acid, gradually, a few drops at a time, to B, well shaking the bottle after each addition. When all is added, well shake for five or ten minutes, so that the emulsion may be thoroughly mixed, as on this, to a very great extent, success depends. The bottle of emulsion is now put aside for about twelve hours to allow all impurities to settle. It can then either be filtered through cotton wool or the liquid decanted into another bottle, when it will be ready for coating the paper. This should be a special paper, which is sold for emulsion purposes, known as baryta paper. Now for coating, this is a very simple matter. I use a double frame (shown); in fact, it is like a wooden dish, with the bottom hinged on. You open the frame, put in the paper, and close again, fastening with two clips; this forms a nearly watertight dish. You pour the emulsion on and cover the paper, pouring off at the spout at the bottom corner. Now care must be used in pouring off; the dish must be rocked gently to prevent crapy marks through the emulsion running all in one direction. When set, this takes a few seconds, the paper is taken out of frame and hung up to dry, which it will do in one or two hours, but do not be in too great a hurry, for if it should not be dry when put in printing frame, it will spoil your negative. When dry, trim round the edges, and print till the heavy shadows are slightly bronzed. Collodion papers are much quicker printing than either albumen or gelatine, and more especially in winter time, being so sensitive to the yellow rays.

It can be toned in any bath, either platinum, gold, or a mixture of each. My favorite bath is acetate soda 40 gr., water 8 oz., gold chloride 2 gr., then add three to four drops of a saturated solution chloride of lime. This bath improves with age. If it tones too fast, add water-fixing bath, hypo 1 oz., water to 12 oz., and let prints remain in ten to fifteen minutes, then wash well for about an hour. It tones much better with platinum than gelatino-chloride prints do, as there is no tendency to discolor the prints as with gelatine.

The first time you tone a collodion print you will quickly notice how evenly it tones, and what an easy job it is compared with gelatine. You never get double tones, and any color from red to black can be obtained in one bath, simply a question of longer time in the solution to get the darker tones. The tones of collodion prints are also much richer than any other printing paper. You cannot get satisfactory warm tones on gelatino-chloride papers without using a combined bath at a great risk of permanency. You perhaps get a nice tone on one lot of paper; the next lot you cannot get the same tone.

I have tried most of the gelatine P.O.P. in the market, and not one of them comes near a collodion paper for rendering the half tones and repeating any tone you may desire.

The state of the atmosphere has a very marked effect on gelatine papers, and is the cause of most of the trouble; they so readily absorb moisture in damp weather, and then print and tone quite different to paper printed and finished in dry weather. In toning gelatine papers the half tones are overdone before the shadows are hardly commenced. You will never get this defect with collo-dio-chloride; the film is so thin that the toning solution readily and evenly attacks the whole of the surface. The shadows, no matter how heavy, are finished same time as the most delicate half tones, and there is a much longer scale

of gradation in collodion paper than gelatine. The film is also proof against any change of climate; in damp weather it will print and tone just the same as dry.

In the hot summer months we all know that gelatine prints require very careful manipulation; the surface (especially if toned with sulpho-cyanide) becomes very soft, and so soon gets damaged. With collodion prints this is not so; the film never becomes soft—in fact, you can use hot water for washing without affecting the prints. I have used hot water when I wanted to get rid of the hypo very quickly. Also many of you have, no doubt, observed that there is always a grain in gelatine papers. With collodion you get purer whites and a finer surface than even albumen, and considerably more detail than any other printing process. The prints can be burnished with a bar or roller burnisher, but for lubricating, alcohol must not be used. A little Castile soap dissolved in water instead.

Any other chlorides may be used instead of zinc, but the great advantage of zinc is that it will dissolve in ether or alcohol, whereas most others require water. The less water used in the emulsion the better; it tends (if in too great a quantity) to give crappiness. The glycerine is added to keep the paper from curling, and if the quantity mentioned is used, it will keep perfectly flat.

The emulsion will keep well (I have some made in February, 1893, which is still in good condition) if kept in a dark place in a well corked bottle. I use a red bottle, as it can then be handled in daylight without fear.

Some of the prints you see to-night I have coated the paper this week from the emulsion made in February, 1893, which I think you will agree with me is a good test for its keeping qualities.

As regards permanency, I have every reason to believe that if care is taken to thoroughly fix and wash the prints, they will be as permanent as any silver print can be. Captain Abney states, speaking of the Simpson type, a similar process, that these prints should be permanent, and the process one of rare beauty. One or two prints shown I finished about five years ago; they are printed on ordinary writing paper, and have been knocking about my dark room cupboard ever since; they were some early experiments in this direction.

Opal glass, lantern slides, etc., may be coated and printed out. In the case of lantern slides they must be printed very deep; in coating glass a substratum should be used, or the silver will crystallize on the surface. I find the following answers very well and will keep indefinitely: Egg albumen 2 drachms, add acetic acid 1 drop, water ½ drachm, well stir up, filter after settling for about two hours, add two drops of liq. amm. 0.880.

The guncotton used should be that known as high temperature. Rouch & Company make it especially for emulsion processes, and it is very good.

Methylated sulphuric ether, costing from 1s. 2d. to 1s. 6d. per lb., and meth. spirit I have always found, if purchased from a reliable dealer, quite good enough. I would add one word of caution—do not use the emulsion near a gas flame. The ether very quickly ignites.

If the emulsion does not flow over the paper evenly after using a few times, the ether has evaporated, and 2 parts ether and 1 part meth. spirit should be added until thin enough; care must be used in coating paper not to let the emulsion stop, but flow over in one even wave, or ridges will be formed which will show in the finished print.

Great thanks are due to the Paget Prize Plate Company, as they were the first firm to put an English made collodion paper on the market. I have used their paper, and can speak in the highest praise of it. I have some prints here on their latest introduction, viz., a matt surface collodion paper, which is a great advance on matt gelatine papers. Very fine black tones rivaling platinotype in appearance can be got by toning with platinum and gold; you will see the great range of color in the tones of the prints shown, from red to black, and all were obtained in one bath only, viz., acetic soda. A grain and a half of gold was used for seven whole-plate prints.

In conclusion, I would urge you to give collodion paper a trial, and I am convinced you would soon discard gelatine. Read before the South London Photographic Society.—Photo. News.

CONCERNING FUMING SULPHURIC ACID.

By R. W. HILL.

THE so-called Nordhausen or fuming sulphuric acid, H₂SO₇, is a compound of a molecule of ordinary sulphuric acid, H₂SO₄, with a molecule of sulphur anhydride or sulphur trioxide, SO₃. By heating the fuming acid, the molecule of SO₃ is readily driven off.

Nearly every text book on chemistry informs the student that this acid is still manufactured in Nordhausen, in Saxony, Germany. As a matter of fact, it was never manufactured in the said town, but in Goslar, a couple of miles from Nordhausen. At the present time, however, this acid is not manufactured at all either in or near that place; but this particular chemical branch is, practically speaking, monopolized by the large chemical concern of Johann D. Starek und Sohne, near Prag, Bohemia. They produce it in the old-fashioned manner by distilling green vitriol or ferrous sulphate—

The anhydride thus given off is absorbed by rain water or sulphuric acid, 66° Baumé, thus producing fuming acid.

About twenty-five years ago Professor Cl. Winkler, of Freiberg, suggested the use of platinized asbestos as a "catalytic" substance for the union of pyrite- or brimstone-kiln gas, SO₂ (sulphur dioxide), with the oxygen of air. The most favorable proportions are 29.6 vol. SO₂ + 70.4 vol. atmospheric air (containing 14.8 vol. oxygen); but for practical purposes it is advisable to employ a dry gaseous mixture of 25 per cent. SO₂ + 75 per cent. air; the dry anhydride does not attack cast or tinned iron. In some works in Russia and Germany this process is actually carried out on a commercial scale, with some modifications and improvements in the old idea.

In Kalk, near Cologne, Germany, Wolter's process is used, by distilling hydric sodic sulphate—

The sulphate of soda is then treated with sulphuric acid, in order to get again hydric sulphate—

About five years ago a German chemist produced the fuming acid from the ordinary sulphuric acid by means of an electric current. Carbon plates, about one eighth inch apart, were immersed into sulphuric monohydrate, and an electric current passed through the fluid. The water of the acid is decomposed into hydrogen and oxygen, and the SO₃ is absorbed by the electrolyte, this forming fuming sulphuric acid, SO₃ + H₂SO₄ = H₂S₂O₇. As soon as a layer of sulphur is observed on the electrodes, the current is reversed. As far as the writer knows, this electrical process has never been tried on a commercial scale.—Chemical News.

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