

terms somewhat exaggerated. He says,—“When I consider the variety of theories which may be formed on the slender foundation of one or two facts, I am convinced that it is the business of the true philosopher to avoid them altogether. It is more laborious to accumulate facts than to reason concerning them; but one good experiment is of more value than the ingenuity of a brain like Newton’s.”

A NEW METHOD OF USING PAPER IN PLACE OF GLASS FOR NEGATIVES IN DRY-PLATE PHOTOGRAPHY.

By LEON WARNERKE.*

All photographers are aware that photography out of the studio, with the systems now employed, presents certain difficulties which make the process of taking a photograph anything but pleasant. Having, in my photographic excursions, experienced all these inconveniences, I adopted from time to time different improvements; and having now arrived at a very satisfactory solution of that all-important question for every photographer engaged out of the studio, I intend to give a full description of my method of working, and illustrate it by practical demonstration.

I scarcely need discuss the question whether the wet or dry system is to be employed for landscape photography. Owing to the great perfection reached in the preparation of collodion and gelatine emulsions, my choice is made, without hesitation, in favor of the dry system.

The first obstruction encountered is the material employed at present for the support to the sensitive film. Glass, notwithstanding the last extremely important discovery of M. de la Bastie, possesses many disadvantages when used in out-door photography. 1. It is heavy. 2. It is bulky in itself, and more so from the necessity of leaving empty space between the plates to prevent contact with the sensitive surface; and, again, from the necessity of having some kind of box

* Communicated to the South London Photographic Society, at their meeting, June, 1875.

for storing. 3. It is brittle, and consequently requires extra care in transport. But the drawbacks are too numerous to enumerate. They are visible to every photographer, and I hope that experiments I have to perform, while showing the superiority of my new system, will render the disadvantages of glass more salient.

My principal improvement upon the old system is the substitution of paper, cloth, or any flexible material for glass, as support for the sensitive film. In my early experiments (made some five years ago) I applied simply bromized collodion to paper of fine texture sized with starch. But when it was used without substratum, prolonged development or further intensification occasioned discoloration of the paper by the action of the pyrogallic acid, and it consequently was regarded by myself as unsuccessful. But I cannot omit to mention it on the present occasion, for the very important observation made that bromized collodion in contact with the paper is incomparably more sensitive than the same in contact with glass, gelatine, india-rubber, or dammar varnish. The paper used by me was Steinbach's photographic. My experiments were made a long time before Mr. Bolton published his excellent washed emulsion process, so my collodion was made from—

Sulphuric ether,	. . . . .	4 ounces.
Alcohol,	. . . . .	4 “
Solution of bromine 1 dr. in alcohol 1 oz.,	. . . . .	20 minims.
Suitable pyroxyline,	. . . . .	40 grains.
Nitrate of silver (in hot alcohol) or equivalent of oxide of silver,	. . . . .	80 grains.

Neither preservative nor washing was necessary.

My next step was using a gelatine substratum between the paper and bromized collodion. In that and in the former case, to avoid discoloration, the developer was free from water. After exposure, the sensitive surface was flowed with a solution of—

Pyrogallic acid,	. . . . .	30 grains.
Alcohol,	. . . . .	1 ounce.

The excess was returned to the bottle for future use, and the following solution was immediately applied:—

Alcohol,	. . . . .	1½ ounces.
Solution of bromine 1 dr. in alcohol 1 ounce,	. . . . .	10 minims.
Strongest ammonia,	. . . . .	2 drachms.

The negative, when finished, was put on the glass, immersed in hot water, and the temporary paper support peeled off. Further experiments prove that great simplification and excellence are secured by the following method:

Preparation of the Negative Film.—I take a sheet of white enameled paper, bend all the sides to form a shallow dish, put it on a glass plate of suitable size, pour in the centre some plain collodion to which a small quantity of paraffine in alcohol was added, and return the excess, after distribution and usual rocking, to the bottle. This, when dry, will leave the paper very easily; but, to avoid this premature occurrence, lines are made with ruling pen or brush and asphalt varnish round the sheet; or, if it is to be cut, each plate is to be delineated with varnish. When this thin coating of collodion is dry, a solution of india-rubber in benzine is applied in a similar way. When dry, another coating of the following collodion is applied.

Ether,	.	.	.	.	.	.	20 ounces.
Alcohol,	.	.	.	.	.	.	40 "
Castor oil,	.	.	.	.	.	.	1 ounce.
Pyroxyline,	.	.	.	.	.	.	1 "

After drying, another india-rubber coating, and, lastly, sensitive bromized, bromo-iodo-chloro, or any of the washed collodion emulsions, is applied. When gelatine emulsion is preferred, the last india-rubber coating is omitted. I find the film is equally good when, after first coating of the collodion and paraffine, the following solution of gelatine is applied:—

Gelatine,	.	.	.	.	.	:	.	1 ounce.
Sugar,	.	.	.	.	.	.	.	1 drachm.
Glycerine,	.	.	.	.	.	.	.	$\frac{1}{2}$ "
Water,	.	.	.	.	.	.	.	quant. suff.

After it is dry, coatings with collodion and india-rubber follow, and lastly the sensitive emulsion.

In preparing the film, I prefer to build it from several thin coatings, instead of one of requisite thickness, because in that way I can avoid irregularities in thickness occasioned by curling of the paper. For the same reason draining of the solution is made each time from a different corner.

The prepared negative film, with its supporting paper, is cut to the desired size, interleaved with tissue paper for extra security, and preserved from light for use.

Exposure.—For large plates the film is exposed in the usual dark slide behind the glass plate. I choose the glass plate the same thickness as the ground glass in the focussing-frame, and, after reversing the last, I have the sensitive and focussing surfaces to coincide. For small plates, from $6\frac{1}{2}$ by $8\frac{1}{2}$ downwards, I prefer to avoid the use of the glass plate, and attach the paper with sensitive film to some rigid support. Mounting boards answer the purpose very well; but when even this inconsiderable thickness is objectionable, ferrotype plates are an excellent substitute. Negative films with supporting ferrotype plates are so thin that in my excursions last summer I was able to put twenty of these plates in every dark slide; and having with me Howard's tent, attachable to the camera stand, in three dark slides sixty negatives were taken without necessity to repair home, or to have a plate box for those sixty plates.

Development.—For the development, I have to detach one corner of the film with a penknife, and, holding it with two fingers, all the film can be easily detached from the supporting enameled paper.

After this, it is attached to a glass plate of the same size by means of a few drops of water. From that moment the development of the negative is proceeded with in the manner familiar to every photographer. In fact, the film is attached so firmly to the glass plate that there is not the slightest difference in the behavior of that and the old glass plates.

After development, fixing, and washing, some blotting paper is applied to remove the last drop of water. This mode of drying—provoking shuddering in the followers of the old glass system—need not be feared with my films. The final drying—especially when gelatine is used in the formation of the supporting film—must be executed under light pressure, between blotting-paper, in a book or otherwise.

If convenient, it can be dried on the glass plate and varnished, avoiding varnishes requiring heating of the plate; but there is no necessity for varnishing, except to facilitate retouching.

In this stage I have used the process for the last two years with invariable success, and have hundreds of negatives to testify it.

But I must confess I am subject to all the human imperfections. We are never satisfied with what we possess; and this spring, waiting for longer and brighter summer days, and planning my new excursions, the thought of carrying in my pocket Howard's tent, and the

prospect of plunging my head into that tent for changing each plate after the exposure, looked to me an unbearable torture. For consolation I retired to my work room, and, after some time, succeeded in preparing the slide which is intended to remove the last of the impedimenta in my way.

The Dark Slide.—The principal component parts of the new dark slide are two wooden rollers, on one of which the sensitive film, with its supporting paper, or without, is wound, and there is room enough for one hundred negatives. These rollers are placed in a horizontal position within the dark slide, one near the top, and the other near the bottom. Each roller has a metal head on the outside of the slide, by which it can be rotated; by means of these heads the ribbon of sensitive film can be drawn from one roller and wound, after exposure, on the other roller. To secure perfect flatness there is attached to each head a binding screw, permitting the stretching the film smooth when it is in position. A darkened glass plate is fixed near the front of the slide in the plane corresponding with the focussing surface, this glass plate guides the sensitive film in its progress from one roller to the other, and secures its proper position in the focus of the lens.

The back of the dark slide is closed by a hinged door, and the front has a sliding shutter.

Before the sensitive ribbon is attached to the roller it is divided into sections, corresponding with the size of the plates, by black lines drawn in pencil or otherwise, and each section is numbered.

In the sliding shutter is a little window secured with orange glass and spring metallic shutter. Through the orange glass I am able to observe the black lines forming divisions between the plates and corresponding numbers. This permits me to judge of the proper position of each consecutive plate, and tells me which plate is to be exposed; and if any imperfection was observable, which plate to avoid.

The production of negatives in the field with the aid of these improvements is a real enjoyment, because all the hard work is removed, and advantages gained over the old system are numerous.

Volume and weight of plates and apparatus are diminished.

Chance of breakage there is none; chance of abrading the sensitive surface is diminished. I ascribe to the flexibility of the support the greater amount of resistance to rough treatment my film offers.

There is no blurring possible. In application to the panoramic camera, what can offer facility similar to the new film? All costly cylindrical plates and special printing frames are useless; the sensitive film can take any shape in the dark slide, but will be flat in the printing frame.

For printing in carbon, and for all processes requiring reversed negatives, the film negative is ready without preparation. For printing stereoscopic negatives transposition is easy.

For storing negatives, no room, no boxes, or shelves are necessary. Film negatives are not destroyed by atmospheric influences.

Lastly, who can with the glass system, while going to distant lands, dream of taking one thousand plates for his long excursion? But with my film, that number, or one still larger, would not increase the weight of the traveler's luggage more than by a few ounces, and by a few inches the volume.

When I look to the future, the circle of the beneficial effect still widens.

Pliability of the sensitive film can alter optical conditions of our apparatus. Our lenses will be smaller. Definition more perfect. Distortion, spherical aberration, and other optical imperfections diminished. Aperture increased, and consequently exposure shortened.

I conclude with another less important improvement. I do not like the black cloth we use to cover our head when focussing. It gives a mysterious appearance to the operator, and increases the curiosity of the passers-by. Very often it conspires with the wind, without any respect for the head-dress of the operator, or stability of the camera.

In my apparatus I substituted a looking-glass inclined 45° to the ground glass. The image appears in right position, is much brighter, and when shut the frame containing the mirror offers a protection to the ground glass, taking infinitely less room than the black cloth.

Explosion in a Drug Store in Boston.—The *Boston Journal of Chemistry* is of the opinion, the extraordinary explosion which occurred several weeks ago, at the store of Mr. G. D. Dows, in Washington street, in that city, was caused by the vapor of ether, the proprietor having stated that he had in the building, several bottles holding five pounds each of this dangerous agent.