

Further, if an employee has been but a short time in the service of an employer then his average earnings under previous service shall be considered.

An employee working for two firms can claim from either, as compensation for injury, half his total wages. For instance, A works for B from 9 a.m. to 5 p.m. and receives £2 per week; from 6 p.m. to 10 p.m. he works for C and receives 15s. per week; if then he receives an injury whilst working for C, the amount of compensation shall be 40s. + 15s. ÷ 2 = 27s. 6d., which he can claim from C.

Any contract or understanding, written or unwritten, between employer and employee to the effect that the latter shall not be entitled to the benefit of the Act is contrary to law and void. This obviously is aimed at an employer who might, when an action or claim was made against him by a deceased employee's dependants, produce a written agreement to prove that the deceased contracted out of the Act.

Should any person undertake a contract for work and lease it out to another person and an accident occur to the latter's employee, then the first person is liable to claim for compensation. As an example, let us take the case of a firm of photographers, X., who undertake a contract for doing the whole of the photographic work of a large engineering firm in London, for instance, and in the course of that contract are required to obtain a photograph of some particular subject at Edinburgh. By the terms of the contract it would not pay X. to send an operator specially to Edinburgh, so they employ a local photographer, Y., to do the work. Y. sends an operator who is injured, then the claim for compensation can be made against X., and the only satisfaction that he has is that he may claim indemnification from Y. The employee can claim against either X. or Y., not from both, and supposing that X. is a wealthy man, and Y. but a man of straw, there is not much doubt

as to what would happen, and in either case X. is in an unhappy position.

Should an accident happen to an employee through the wilful neglect or carelessness of a third party, who is not the employer, then the claim would lie against this third party, and the employer can claim indemnification from him. This obviously means that if a photographer sent an operator to take a photograph at a third person's premises, and the operator was killed or injured through the wilful neglect or carelessness of this third party, then the latter is liable to pay compensation, but not both compensation and damages.

Any weekly payment arising under this Act may be reconsidered and ended, diminished, or increased on application by either party, and such weekly payment may be compounded by payment of a lump sum, which shall be sufficient to purchase an annuity from the National Debt Commissioners, through the Post Office Savings Bank, equal to three-fourths of the annual value of the weekly payments. So thoroughly have the legislators responsible for this Act safeguarded this compensation, that it is impossible to assign, attach, or charge it, neither can it pass to any other person, nor can any charge be set against it.

We have not thought it necessary to deal with the methods of recovering compensation, although these would be, of course, of considerable interest to the very large body of employees of all classes who are readers of our paper. We trust, however, that we have said enough to convince every employer that it is at once his bounden duty to immediately insure himself against all possible claims under this Act. Many insurance offices have already fixed their tariff of premiums, and for the sake of the few shillings required it is not worth while risking a possible claim which may hang for years round the neck or lead to a serious drain on one's resources.

EXPERIMENTS ON THE NATURE OF THE LATENT IMAGE AND OF THE NEGATIVE IMAGE.

The following article from "Photographische Korrespondenz" supplies an addition to the proofs of the compound nature of the latent image. Incidentally, Dr. Homolka's experiments (permanent indigo compounds) on bromide paper point the way to the production of blue and red tones

DURING the last two decades various theories have been advanced as to the nature of the latent image: they may, however, be arranged in two groups: (1) Those which ascribe the formation of the latent image to a chemical change in the silver bromide molecule during exposure—the sub-halide and silver grain theory; and (2) those who deny any chemical change, and assume a structural alteration structure theory, photo-electric ionisation without reduction, etc. Each view has doubtless much to recommend it; neither appears to me to be convincing.

The present state of our knowledge as to the nature of the developed negative image is, however, much clearer, and Lüppo-Cramer has proved that the developed negative image is not of a homogeneous nature, but composed of two substances, of which one is most probably metallic silver, the other probably a silver compound.¹

As regards the chemical development of the latent image with organic developers, Eder says:² "The 'chemical' development is characterised by a reduction process, in which exposed silver halide is converted into metallic silver; the unexposed

is, however, left intact. The number of organic compounds which possess this action is doubtless very considerable. . . ."

This extract is important as regards the view which generally exists to-day as to the chemical development of the latent image into a negative. It is assumed that only certain organic compounds of special constitution are capable of reducing the latent image to a visible negative, relatively that the substance of the latent image can only exert an oxidising action on these compounds. The question whether the substance of the latent image is an oxidiser in the wider sense of the word, that is to say, whether it can oxidise not only the so-called developers but also other organic compounds, has, according to my thinking, never yet been investigated, although the answer would doubtless be of considerable importance, not only for the theory of the latent image, but also for that of the negative image. I have therefore approached this question from the experimental side.

Organic chemistry of the present day gives us numerous compounds which are more or less easily oxidised; yet this great assortment is considerably narrowed down by certain requirements which must be given to those compounds chosen for the work in question. The product of oxidation must be first chosen so that it—especially under the peculiarly difficult

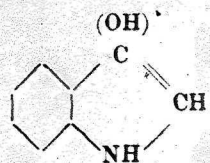
¹ Phot. Korr." 1905, p. 319.

² Handbuch der Photographie, 5th edit., Vol. III, p. 289.

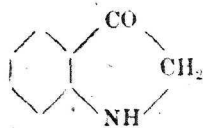
experimental conditions—can be easily and certainly observed; that is to say, it must be coloured. There are a great number of organic compounds, themselves colourless or nearly so, which give strikingly coloured oxidation products. Notable are the so-called leuco-bases of the diphenylmethane, triphenylmethane, and diphenylamine series, which, by oxidation, are converted into the well-known brilliant aniline dyes. Simple consideration of these will at once teach us that they are unsuitable for exact experiments in the desired direction; they all contain two or more amino or oxy groups, or the two together, in combination with aromatic benzene nuclei, and may therefore be suspected of being capable of acting as photographic "developers" in the usual sense. In the case of a few—e.g., leucindamine and leucoindophenole—ordinary developing powers can be proved without difficulty. The use of these substances might, therefore, easily lead to fallacious conclusions. Finally, it is desirable, if not absolutely essential, that the coloured oxidation product of the substance used should be insoluble in water, and, therefore, remain at the place of its formation; in any case, the observations would be made much easier by this property.

With these facts in view, I have examined a great number of organic compounds as to their behaviour towards the latent image, and finally found two which satisfy the stated requirements. These are indoxyl and thioindoxyl; the latter is closely allied to the former in chemical behaviour.

Indoxyl which is the intermediate product in the production of indigo from indol, exists in two forms—in the normal form as β -indoxyl, and in the so-called ketonic or pseudo-form:

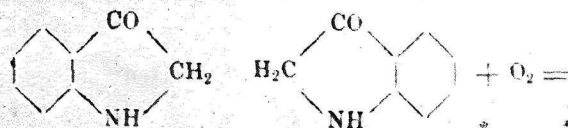


Indoxyl = β -Oxyindol.

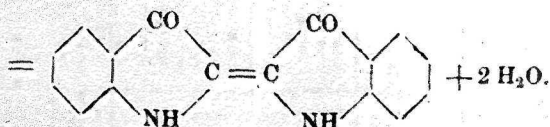


Pseudo indoxyl.

It dissolves freely in water with a faint yellowish colour and greenish fluorescence, and this solution is completely and instantaneously oxidised to indigo by the very mildest oxidiser, according to the equation:

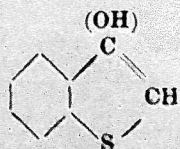


2 molecules Indoxyl.



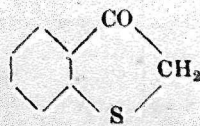
1 molecule indigo.

The so-called thioindoxyl:



Normal form.

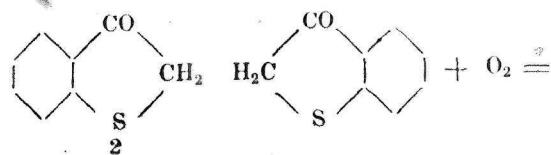
or



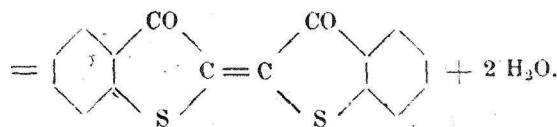
Pseudo-form.

or pseudo-form, is slightly soluble in water, but dissolves easily

in dilute alkalis. In these solutions it is converted by oxidising agents into red thio-indigo, according to the equation:



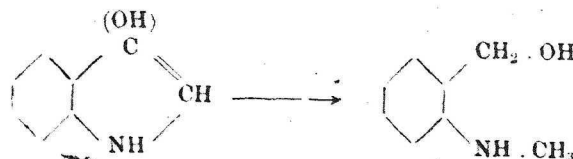
2 molecules Thio-indoxyl.



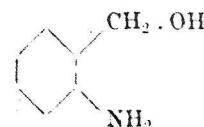
1 molecule Thio-indigo.

Experiments have now proved that indoxyl, as well as thio-indoxyl, is oxidised by the substance of the latent image or a certain part of the same, to the corresponding indigo dyes.

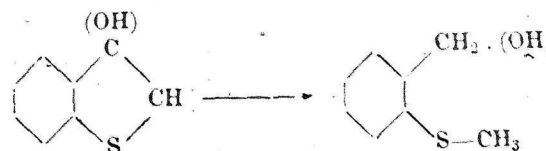
Before any theoretical importance is attributed to this fact, one must try whether the two indoxyls cannot act as developers in the ordinary sense. This question can be definitely denied according to the present state of our knowledge of the connection between chemical constitution and developing power. At any rate, one might imagine that indoxyl had developing properties, for one can imagine—at least, for the meantime, only on paper—that it could be split up into a methyl-o-amino benzyl alcohol:



which could always act as a developer. The simple o-amino benzyl alcohol:



possesses, as I have proved experimentally, no developing power; therefore, such is not to be expected with methyl-o-aminobenzyl alcohol. The behaviour with thio-indoxyl is much more favourable; this can—also only on paper—be thought to be resolved into the following substance:



which lacks every sign of a developer.

The latent images necessary for this experiment were obtained by exposing gelatino-bromide plates with 3 per cent. of silver iodide, behind a Chapman-Jones photometer scale to a standard candle at 305 mm. distance for thirty seconds. After development with amidol, the plates showed a sensitiveness of 22 deg., corresponding to 12 deg. Scheiner.

The Action of Indoxyl and Thio-indoxyl on the Latent Image.

If an exposed plate is placed in about a 2 per cent. aqueous solution of indoxyl, a visible image appears. An addition of sodium sulphite to the developer accelerates development; potassium bromide, even when added in considerable quantities,

does not slow it, and keeps the plates very clean. The following developer is therefore recommended:—

Sodium sulphite, 6 per cent. sol.	100 ccs.
Potassium bromide	5 gms.
Indoxyl	15-20 gms.
Water	1000 ccs.

In this the plate will be thoroughly developed in from five to eight minutes; it should then be rinsed with water and fixed in the ordinary way in an acid fixing bath.

The same phenomena appear if thio-indoxyl is used instead of indoxyl.

The following developer should be used:—

Normal soda lye*	100 ccs.
Sodium sulphite, 6 per cent. sol.	100 ccs.
Thio-indoxyl	15 gms.
Water	1000 ccs.

Examination of the Image Developed with Indoxyl and Thio-indoxyl.

Examined by daylight, the image developed with indoxyl appears green, that with thio-indoxyl orange-yellow. Both show a strong metallic lustre by reflected light. Superficial observation at once shows that the images are not of a homogeneous nature, but consist of indigo or thio-indigo and metallic silver. Both images—the “indigo image” and the “silver image”—can be separated one from the other without difficulty.

* Strong solution of caustic soda.

If the plate developed with indoxyl, after washing, fixing, and hardening with alum, is transferred to a solution of potassium cyanide, the silver image will dissolve, whilst the indigo image, which is now pure blue, remains behind. In the same way, there can be obtained from the plate developed with thio-indoxyl the red thio-indigo image. If, on the other hand, the plates are immersed in a weak solution—3 to 5 per cent.—of sodium hydrosulphite ($\text{Na}_2\text{S}_2\text{O}_4$), the indigo image is reduced, and goes into solution as colourless indigo white, leaving the silver image behind. The latter appears brown by transmitted light; by reflected light, white, with metallic lustre similar to the physically developed image on a wet collodion plate. From the used hydrosulphite solution blue flocks of indigo or red flocks of thio-indigo separate out on exposure to the air.

The plates developed with these two substances can be bleached with mercuric chloride in the ordinary way. Naturally, only the silver image is bleached; the indigo or thio-indigo images remain unchanged. If the bleached plate is placed in sulphite or ammonia solution, the silver image is blackened in the usual way.

Solarisation phenomena can be carried out with the indoxyl developers; the results are far more certain than when an ordinary developer is used. Excellent duplicate negatives can be prepared by this method.

Both for transparencies and bromide paper beautiful results can be obtained by means of these developers; the method is obvious from what has been said above.

DR. B. HOMOLKA.

THE EXHAUSTION OF THE FIXING BATH.

WHEN a number of plates are successively fixed in a solution of hypo, a time comes when, before complete exhaustion of the solvent power of the bath, it is advisable to reject the solution, because the plates fixed under these conditions may subsequently, if insufficiently washed, show various changes, and particularly a brown stain.

The question is to know within what limits the bath should be used in order to avoid these changes. Gaedicke attempted to elucidate this point by an interesting study,¹ starting from the principle that there was identity between the discoloration of badly washed plates which had been fixed in a partially exhausted bath, and the browning very rapidly obtained on exposing, to air and light, paper impregnated with hypo solution with a sufficient addition of silver nitrate. By determining experimentally the minimum quantity of silver nitrate which must be added to a given solution of hypo to cause the commencement of yellowing and converting these results into silver bromide, Gaedicke deduced the limit of the use of a fixing bath.

Assuming that one admits that the same double salts are formed when sodium hyposulphite acts with silver nitrate as with silver bromide, the conclusions drawn by Gaedicke seem rational, but the principles on which the experiments were based not appearing to us to be quite precise, we proceeded to verify them.

For this reason we have repeated Gaedicke's experiments, and substitute bromide for nitrate of silver—that is to say, we have worked under conditions practically identical with those that occur in practice, and have also investigated the influence of the concentration of the fixing bath, and that of the various additions, such as sodium bisulphite and alum.

In all our experiments we have added increasing weights of silver bromide, well washed and pure and prepared in the dark to the same volume of solution of hypo.

A first series of experiments were made with solutions of hypo

from 5 to 45 per cent., so as to determine the influence of the strength of the hypo solutions on the use of the bath.

In a second series of experiments we added to a normal solution of hypo, 15 per cent., the usual quantities of sodium bisulphite and chrome alum, and we have tested whether these additions exert any action on the phenomena.

For each test a drop of the solution was placed on filtering paper and then exposed to the air and light.

We have determined in every case the maximum weight of silver bromide which can be dissolved in each solution of hypo without producing the brown discoloration.

The results of our tests are given in the following tables:—

A.—The Effect of the Strength of the Hypo Solution.

Strength of the hypo solution.	Weight of silver bromide which can be dissolved in 100 ccs. of the solution.	Maximum weight of silver bromide which can be dissolved without causing subsequent yellowing of the negative.	Ratio between the maximum weight of silver bromide that will dissolve and that which will cause subsequent yellowing.	Weight of silver bromide calculated as necessary to form the compound $\text{Na}_2\text{S}_2\text{O}_3 + \text{Ag}_2\text{S}_2\text{O}_3$.	Ratio between the maximum weight of silver bromide which will not cause yellowing and the weights which correspond to the salt $\text{Ag}_2\text{Na}_2\text{S}_2\text{O}_3$.
5 per cent.	2 gms.	1.25 gms.	62 p.c.	3.8 gms.	33 per cent.
15 "	6.3 "	3.8 "	60 "	11.4 "	33 "
45 "	20.5 "	5.6 "	24 "	34.2 "	15 "

B.—Action of Sodium Bisulphite with and without Chrome Alum.

15 per cent. hypo + 1.5 per cent. acid bisulphite lye.....	6.3 gms.	3.8 gms.	60 p.c.	11.4 gms.	33 per cent.
15 per cent. hypo + 1.5 per cent. bisulphite lye + 0.5 per cent. chrome alum.....	6.1 "	1.65 "	27 "	11.4 "	14.5 "
	5.9 "	2.2 "	38 "	11.4 "	20 "

¹ “Eder's Jahrbuch,” 1906, p. 64.