THE PRESERVATION OF PHOTOGRAPHIC RECORDS.

AFTER the article by Dr. W. J. S. Lockyer on the disappearance of photographic images (p. 278) and other references that have been made to this subject, there is no need to dilate upon the importance of the preservation of the vast number of photographic records now being produced in our observatories and laboratories. I would, however, venture to express surprise that the fact established by Dr. Isaac Roberts as to the want of permanence of a silver photographic image appears to have been unexpected, bearing in mind the general procedure that appears to be the rule in the production of such photographs.

Photographic procedure is based chiefly, practically speaking, indeed, entirely, upon "rule of thumb," and if each modification requires a ten years' trial of it to establish its advantage or otherwise, it is at least desirable that more attention should be paid to the principles which govern the production and the permanency of photographs. It is well known that metallic silver is liable to change, yet we cannot get away from the use of silver salts, and these, of course, give silver images. *But silver ought never under any circumstances to be relied on.* The questions that present themselves, therefore, are: (1) how best to preserve the original silver image, and (2) how best to copy it.

It has been suggested to give up gelatine and go back to collodion. But this suggestion appears to be founded on nothing better than the quite insufficient evidence of general experience, and partly, also, on false inference. Metallic silver, we know, is affected by the air, and in a wet collodion plate the silver lies chiefly on the surface of the film, while in the ordinary dry plates it is buried in the gelatine. Moreover, experienced photographers tell us that the image on wet collodion plates gets denser with age. If it does so the image is unstable, and change, however it manifests itself, must be avoided if the photograph is to be accepted as trustworthy. The coarser grains and crystalline character of the image produced on wet collodion would account for its superior resisting power to outside influences, but this alleged superiority has not yet been proved. We cannot go back to collodion, but under any circumstances there appears to be no good reason for expecting any gain in that direction. Gelatine is the medium of to-day, and no evidence of its unfitness has been adduced.

Metallic silver is soluble in such reagents as dissolve silver oxide, if air or an oxidiser is present. Ammonia, potassium cyanide and sodium thiosulphate readily dissolve silver in the presence of air. The oxidation products of developers act as oxidising agents. Ferric oxalate, the product of development with ferrous oxalate, is particularly active in attacking silver, and is practically used for the purpose of thinning silver images. And the coloured products of oxidation of alkaline developers are well known to retard the reduction of silver salts, though apparently they have not been shown to be able to directly attack the metal itself. But it must be remembered that that which produces no appreciable effect in a few months, or even years, may have a disastrous action in a generation, so that the only safe course is to eliminate or exclude every suspicious substance. In short, the photographic film should consist of pure silver in clean gelatine, for anything more than this that is likely to be present will, in all probability, prove deleterious.

There is no difficulty in banishing at once ammonia, ferrous oxalate and potassium cyanide. The ammonia in the developer is replaced by sodium carbonate, an exchange in every way advantageous, the ferrous oxalate by alkaline developers, a change which has already met with general approval, and potassium cyanide as a fixing reagent is practically obsolete. The two great dangers that are not sufficiently appreciated by many photographers are the presence of thiosulphate from the fixing bath and oxidation products from the developer. To remove the first, the usual half-hour of washing is not sufficient, however the water may be applied. There is no particular virtue in running water or in washing contrivances; it is the prolonged soaking in clean water that is wanted. However the washing is done, it is easy to remove the greater part of the thiosulphate; it is the last traces that are hardly, if at all, susceptible to detection by any of the ordinary methods that need attention. If after half an hour it is not possible to detect any thiosulphate in the wash water, a further soaking for an hour and a half, with suitable changing of the water, would not be excessive treatment.

The same washing that gets rid of the fixing reagent washes out the developer and its oxidation products, if the work has been carefully and successfully done. But to ensure this the developer must have sufficient sulphite (sodium sulphite) in it to prevent its discoloration or the staining of the film. The deposition of staining matter should be prevented, as removal is tedious and troublesome. Many published formulæ for developers prescribe an insufficiency of sulphite, and it is not possible to state definitely how much is required, because that will depend on the time taken for development and the amount of sodium carbonate present. But generally, if not always, and certainly when using pyrogallol, the sulphite should be proportioned to the bulk of developer—that is, to the water; it is unsafe to dilute the prepared developer without adding the further quantity of sulphite to maintain its due proportion.

The method generally adopted at the present time to get rid of stains is founded, like so many other photographic methods, on a false basis. The idea is that if a stain disappears, it has gone. The appearance, truly, has gone, but the matter that constituted the stain may remain, and perhaps in a more dangerous form than it was at first. In almost all cases the effect of acids on stains due to oxidised developers is to lighten the colour of the staining matter and to render it insoluble. The action of alkalies is to darken its colour and to render it soluble. Alkaline solutions are, therefore, true clearing reagents, while acids are actually prejudicial, although they appear to effect improvement. It is desirable to carefully avoid the use of any acid solution whatever, and by doing so it will be found that cleaner and chemically purer plates are produced. After developing in an alkaline solution and rinsing the plate, it should be fixed in a solution of sodium thiosulphate made alkaline with sodium carbonate, and then well washed. The washing may be done with plain water, but if there is the slightest trace of colour due to stain, it will be found of advantage to add a little carbonate of soda or a very little caustic soda to the first wash waters. Acid fixing baths should be absolutely eschewed. The very grave risk that accompanies their use is not appreciated, or they would never be recommended.

Having thus obtained a really clean (that is, chemically pure) plate, the exposed surface of the film must be protected in some way to keep the image as much as possible from the air, and also to prevent contamination by the acid perspiration from fingers when handling it.

For this purpose a celluloid varnish will be found a better protection than the ordinary lac varnishes, but whatever is used it is desirable that the gelatine be dried before it is applied. By warming the plate until it is as hot as the hand can bear, and then allowing it to cool to the desirable temperature for varnishing, even though the varnish may have to be applied to the cold plate, the film is probably effectively dried. But what seems to be a much more effective method of preserving the film from outside influences is to cement on to it a cover-glass by

means of Canada balsam, and this is not difficult to do after a little practice.

By thus securing, as far as possible, an image of pure silver in a clean gelatine film, drying it and sealing it up, the photographer will have taken what appear to me to be the best steps possible to preserve the photograph. It may be a little more trouble than the ordinary routine, but hardly so much trouble as is involved in the practice of other photographic methods, such as wet collodion or daguerreotype. But whatever the trouble, nothing short of such treatment as has been indicated will give the photographer the satisfaction of knowing that he has done his best to preserve his plates. I have not referred to toning, although so great an authority as Sir William Crookes has recently referred to it, because a toning process gives a more complex image, and therefore a more difficult one to deal with, but also, and chiefly, because toning is an incomplete operation, and so gives an image of varying composition, and can hardly, by the nature of the action, produce a proportional change throughout the whole image. The fainter detail will be proportionately more affected than the denser parts. Measurements of the effects of the light are thus rendered impossible, or at least doubtful, and so useless.

But whatever care is taken to secure the preservation of the original plate, if it is valuable or likely to become valuable, it alone should not be trusted as the only record of the result it bears. Within a comparatively short time of its production, say within a few months, one or two prints should be obtained from the plate. These prints should be produced in the most simple manner possible in order to avoid personal bias or other possible errors consequent on a multiplicity of manipulations. They should be of the nature of printed-out prints, because a developed print (such as one on bromide paper) allows much scope for variation. Obviously the prints must be permanent. Platinum and carbon prints are the only ones that fulfil these conditions. Both are stated to require "development," but this is a misapplication of the word, or a different application from that which refers to the development of gelatino-bromide plates. The point is that the full chemical effect in both platinum and carbon prints is produced by exposure to light alone, the after treatment only utilising the change. A platinum print is probably more trustworthy as to permanency than a carbon print. The paper used must be of excellent quality, or the sensitive coating would be interfered with, and there appears to be nothing whatever that will affect a platinum image, unless, indeed, it is treated with chemicals that disintegrate the paper at the same time. Platinum prints, however, are not the best agents for showing fine detail or very small differences of density. In this respect they may be improved and much additional brilliancy imparted to them by applying any of the waxing preparations made for waxing prints. For rendering delicate tones, doubtless a carbon transparency would be superior to a platinum print. But if a photographic plate is of such a character that it is desired to preserve its record as nearly as possible for ever, it would not be an undue precaution or an excessive trouble to make two or three platinum prints as well as a carbon transparency from it. If the original plate is to be preserved by sealing it up with Canada balsam, then it should be varnished with a lac or similar varnish for getting the prints. The varnish could then be easily removed, if necessary, before the sealing up of the plate, or a varnish might be used that would be unaffected by the balsam. But on no account whatever must an unprotected film be touched by any platinum paper, carbon tissue, or any paper upon which a printed-out image can be produced, because all such papers contain soluble substances that prejudicially affect the image.

By working on the lines indicated, I think that it would be difficult to set a probable maximum limit to the duration of photographic records. We know how few years are sufficient to produce a measurable deterioration in many of the photographs as at present produced.

CHAPMAN JONES.

A LANCASHIRE COLLEGE.[1]

MR. HARTOG and the authorities of the Owens College are to be congratulated on their work, which owes its origin in part, to quote the words of the preface, "To a request from the committee of the Education Exhibition, held in London in January last, that the authorities of the college should furnish an account of the institution for that Exhibition and for the Paris Exhibition, to which it was preliminary, in part to the desire of the authorities of the college for a record of its development and present condition in celebration of its jubilee."

The introductory chapters deal with the history of the college and its buildings, its government and finance, and its relation to the Victoria University. Then follow details of the classes and lectures, with particulars of the special departments and of other allied institutions, lists of fellowships and prizes, and, lastly, a striking record of original publications by members of the college.

It appears that the earliest attempt to establish a University in Manchester was made in 1640, when Henry Fairfax presented a petition to Parliament in favour of this course. The opposition of the city of York killed the project; the next similar attempt was made in 1877, but the opposition of the city of Leeds led to the establishment of the Victoria University.

Between these dates various efforts were made to promote a college for higher education in the city; none of these, however, met with marked success until, in 1851, the Owens College was founded in accordance with the will of John Owens, a Manchester merchant and spinner.

The first chairman of the Owens trustees was George Faulkner, the friend and partner of the founder, who, it is said on good authority, refused to become Owens's heir, and persuaded him to found a college. Owens's bequest realised about 90,000*l*., and, in accordance with the founder's decision, the income from this was spent mainly on the provision from the first of an adequate teaching staff. To this Mr. Hartog with justice attributes a great share in the ultimate rise of the college. The histories of Owens College and of University College, Liverpool, a sister member of the Victoria University, teach the same truth. Owens College began in a hired house; University College in a disused lunatic asylum; but in both cases the devotion and splendid energy of the staff won in time the confidence of large-hearted men and women in their respective towns, and though the equipment of neither college is yet complete, the laboratories and class rooms, museums and libraries bear striking testimony to the wisdom of those who moulded the institutions in their early days.

Owens College began with five professors and two teachers. To-day its staff consists of thirty professors, thirty-four independent lecturers, and thirty-nine assistant lecturers and demonstrators.

But success did not come at once; the number of day students, which at first was sixty-two, in 1857 dropped to thirty-three; the local newspapers pronounced the scheme to be a mortifying failure. The trustees and the staff, however, held their course, and from 1858 onward the numbers have gone on increasing until, during last session, they reached the total of 1002. A building fund,

[1] "The Owens College, Manchester, founded 1851. A brief History of the College and Description of its various Departments." Edited by P. J. Hartog, B.Sc. Pp. viii + 260. (Manchester: Cornish, 1900.)