BROMOIL AND TRANSFER

PART I—TECHNIQUE

CHAPTER I

THE BROMIDE PRINT

Outline of the Process. For those coming quite fresh to the subject it may be as well to run briefly through the processes involved in the production of a bromoil print. The basis of the subsequent ink-work consists of a bromide print of somewhat special character. This print is developed, fixed and washed in the usual way, and then is subjected to the action of a combined bath or of two separate baths, which produce a tanning of the gelatine of the photographic sensitive layer. At the same time as the tanning action, a bleaching of the silver image is effected, or if two separate baths are used, the first of these brings about the bleaching and the second the tanning. After tanning and rinsing, a second fixing operation is carried out to dissolve out the silver converted into colourless compounds in the bleaching operation, and the print is then dried preparatory to the bromoil operations proper.

If the dried print is soaked in water for a short time and blotted off, a slight image in relief will be seen if the surface of the print is viewed at a glancing angle. The highlights will be raised and shiny, whereas the shadows will be sunken and slightly rough. What has happened is this: the gelatine which originally served to immobilise the silver halide particles has been so tanned that its power to swell in, and absorb, water has been rendered proportional to the original amount of reduced silver in the bromide print. The exact mechanism of this effect is not well

understood, but we need not, in any case, concern ourselves here with the why's—let it suffice that this scientific phenomenon has provided us with a means of re-vivifying our lost silver image, and in a garb excelling by far the original.

Let us take some greasy ink of a thickish consistency and apply it to the blotted-off image in relief. It is at once found that in the more swollen parts the ink is rejected, whereas in the sunken shadows it adheres. In fact the original silver values are re-created in the ink. Once skill is acquired, the former silver image will appear a dead thing compared with the new ink picture, printed by the very hand of the photographer. There are some small difficulties to be overcome before proficiency is attained, and we must therefore proceed to consider the essential stages one by one.

The Bromide Paper and the Negative

The negative is the chronological basis of the finished bromoil as with the silver print, but no negative can be considered without reference to the paper on which it is to be printed, and as the type of bromide print for bromoil is somewhat restricted, the paper may, with some logic, be called the key to the whole position, and appears first in the title to this section. While modifications of contrast are easily within the scope of the process, it is much easier to increase than to reduce the former. Thus, the first precaution to be observed in making both negative and subsequent bromide print is: *Keep the contrast down to a low value.* Dr. B. T. J. Glover has so exhaustively treated the subject of the factors governing negative contrast that we need do no more than enumerate them here.

(*a*) Subject and lighting contrast
(*b*) Time of development at a given temperature.

Of the two heads the former is fixed for any given subject, and the latter constitutes the workers' means of control. For contrasting subjects reduce the time of development, and for subjects showing only a small tonal range increase it. All this is fully treated in Dr. Glover's writings in the

photographic press and in his little book, *Perfect Negatives*. The contrast of the bromide print is such an important factor, especially to the beginner in bromoil, that the thorough study of the whole question is counselled. It is no exaggeration to say that more beginners throw up bromoil in the early stages through attempting to work too contrasty prints, than from any other cause.

It will be well if, before passing on, we suggest tests for the right degree of contrast. In the first place the bromide print which is to serve for the production of the bromoil must exhibit the following characteristics.

(1) The highest lights must show a slight silver deposit.
(2) The deepest shadows must be a medium grey, and must nowhere reach black.

Most bromides will be made by enlargement, and in this case if the negative be developed for three-quarters of the time to produce a bright bromide print under the same conditions, the right range of gradation for the bromoil should be secured. As trial prints by contact on gaslight paper are often made, it should be stated that a very soft print on vigorous gaslight paper will indicate the correct contrast of the negative if a condenser enlarger be used, or a print of similar character on a soft gaslight paper if a diffused light enlarger is available.

Development of Bromide Prints for Bromoil

We have seen above the characteristics of the type of print which it is necessary to make. One further stipulation has yet to be made.

The print must be fully developed.

Here it is again necessary to assume a knowledge of Dr. Glover's work on the development of bromide prints. He has shown that the only reliable and convenient method for developing prints on bromide paper is by the factorial system. The time of appearance of the image is noted, and is multiplied by a factor characteristic of the developer employed, to give the total time of development. When the expression "fully developed" is employed above, the

meaning to be conveyed is "developed to the time indicated by the factorial method, employing an appropriate factor".

The above criteria have been set down, as with all others in this book, as a safe guide to the beginner, but the elasticity of the process is such that almost any *modus operandi* can be practised by those "skilled in the art"—as the phrase goes in patent law.

In point of fact, all three of these criteria have been assailed by experts, who are anything but unanimous on this important matter. A certain number of authorities assert that a fully developed black-and-white print of full contrast is the type to strive for, but in considering this view it has to be borne in mind that many of the opinions of the type quoted refer to the early days of bromoil, before special papers were made, and when it was the fashion to use highly acid bleaching baths, and even acidulated washing waters. When tanning and bleaching baths are employed which depart radically from a neutral reaction, increased swelling of the gelatine is produced, which allows a heavily tanned shadow to be inked up without blocking or refusing the ink.

Development to Lower Factors. Low development factors produce as a first result reduced contrasts in the prints. This would be all to the good if no other complications ensued. In point of fact it is usual to employ a development factor rather lower than would be used if the print were to remain as a bromide. In using the amidol developer, which will be formulated in a subsequent paragraph, a factor of about 16 would produce bromide prints of brilliant quality. The normal factor for the production of prints for bromoil purposes will be about 10, and for transfer this may be reduced still farther.

It has been stressed that development should be full, i.e., a moderately high factor should be employed, and in order to produce in this way the greyish points desired the contrast of the negatives has to be kept low. However, it will not infrequently be the case that negatives of greater contrast than satisfactory for normal use will be available, and the question arises: what is the best method of securing prints of the requisite low contrast? Authorities again

disagree on the extent to which a low factor is advisable, but the facts as disclosed in the experiments conducted by the author would appear to be that although satisfactory bromoils may be made using quite low factors, there is a perceptible loss of gradation and quality. Talking in terms of the above-mentioned amidol developer, the normal factor for bromoil of which is 10, it would not seem advisable to go below 5 unless no value is to be laid on the original gradation and definition. Should the final print in mind be one in which free control is to be exercised there will be little objection, and, in fact, it is possible that the deliberate employment of a low factor will yield a method of producing distinctive results.

It is certainly true that low factors bring about an easy absorption of ink, and in transfer a correspondingly easy parting with the ink under pressure. Thus, in some experiments by C. J. Symes and described in his book, *Perfection in the Pigment Processes*, the factor was carried down as low as 2. Some work by Venn (*B. J.*, 1926, Vol. 73 p. 401) also goes to confirm these results and leads to some important conclusions regarding interdependence of development factor and temperature. This will be referred to later. Another authority, however, in the person of Dr. Emil Meyer, gives no limitations in the direction of the production of soft prints by restricted development. The "Drem" bromoil materials, which are put on the market by Dr. Meyer, are, however, rather different in behaviour from other papers, and it is possible they will stand more extreme treatment in this respect.

Developing Formulæ. Most common developing agents can be used to produce bromide prints for bromoil purposes. It is equally certain that some have great advantages over others. Many developers result in a strong tanning of the gelatine coating of the paper. Pyro is well-known in this respect. The hydroquinone constituent of the usual M–Q mixture is also not above reproach on this score. Actually, however, while it would hardly be good practice to employ pyro to develop bromide prints except for special purposes, M–Q can be used in the production of bromoils without much risk. It is a good precaution,

however, to develop only one print in each lot of solution. This is a tip which applies with no less force to all other operations in the production of the final tanned matrix for bromoil. *Use all solutions once and once only.* In this way ageing and contamination of the solutions is ruled out as a factor in producing varying results. Bromoil has not yet been brought to the state where any aid to standardization can be despised.

M–Q mixtures suffer, moreover, from one other disadvantage, i.e. the very great sensitivity to low temperatures. Below about 40° F. the hydroquinone becomes practically inactive, and there is a serious drop in efficiency at temperatures well above this level. The M–Q borax developers recommended for development of brown-black papers might be quite good for bromoil work, because they give results of soft contrast. They would, however, be subject to the same disadvantages as ordinary M–Q mixtures.

Undoubtedly the best developer for bromoil purposes is amidol. In order to be in good condition it has to be freshly made. It works in weak alkaline solution, and caustic alkalis and carbonates are unnecessary, the hydrolysis of the preserving sulphite producing sufficient acceleration. The development by-products are free from tanning action on the gelatine. Amidol is certainly slowed by low temperatures, but the writer has used it down to well below 40° F. without ill effect beyond prolongation of the developing time. It is advisable to make up the amidol developer an hour or so before use, so that the initial cooling brought about by dissolving the sodium sulphite has time to be corrected by absorption of heat from the surrounding atmosphere.

Proprietary developers of the Paramidophenol type, such as Azol and Rodinal, are quite suitable, especially as they are soft working. Rytol has also been found quite a useful developer. With Azol the normal developing factor for bromide work is 15; and if this is reduced to 10 or 8, results suitable for bromoil are readily obtained.

M–Q Mixture for Bromoil. The following mixture is recommended by Dr. Emil Meyer:

Stock Solution	*Metric*	*English*
Metal	3 g.	23 gr.
Sodium sulphite anhydrous	40 g.	307 gr.
Hydroquinone	6 g.	46 gr.
Sodium carbonate anhydrous	30 g.	230 gr.
Pot. bromide 10% solution	5 cc.	38 minims.
Water to	1,000 cc.	16 ozs.

For use, dilute one part of stock solution with two parts of water. This developer works well with a normal factor of from 3 to 5.

Almost any normal M–Q formula will work equally well, but it should be of the low contrast type with a rather small proportion of hydroquinone and accelerator respectively.

Amidol Mixture for Bromoil. The author uses the following formula given in his book by C. J. Symes, as standard for all his bromoil work, experimental or otherwise, and most of the observations in this book may be assumed to apply especially to this mixture:

	Metric	*English*
Sodium sulphite crystals	14 g.	½ oz.
Potassium bromide 10% solution	0·5 cc.	10 minims.
Amidol	1·6 g.	25 grains
Water to	283 cc.	10 ozs.

Dissolve the sodium sulphite in the main part of the water first. Then add the potassium bromide and amidol, and make up to the total volume.

It is advisable to prepare the amidol mixture in a room remote from the dark-room or from where the prints will be hung up to dry. Small specks of the solid developing agent invariably get into the air during weighing and transference to the solution, and if allowed to settle on the drying prints, or during development, small dark spots will appear, which will necessitate excessive retouching of the final bromoils.

The factor to be regarded as normal for bromoil work with this developer is 10. It may be reduced to 5 or even lower where accurate rendering of gradation and detail

is not a paramount consideration, and especially where transfer is contemplated.

Developing Procedure. In producing a perfect bromide print as a final result, i.e. not for bromoil, development is continued until the lapse of the time calculated by the use of the appropriate factor, a trial print being used to determine what exposure time yields the maximum black of the paper. The production of a perfect print depends upon following this procedure with a negative and bromide paper more or less complementary in gradation.

The judging of the depth of a bromide print for bromoil is not so simple a matter, and to reproduce at will prints of a definite character requires some little practice. To begin with, there are no such definite limiting tones as black and white, but merely very faint grey and medium deep grey. In selecting the portion of the total picture to be covered by the trial strip, an endeavour should be made to include a portion of the highest light and deepest shadow; the latter is specially important. The trial strip should naturally be developed to the same factor as the final print. In order to facilitate judgment of the exact depth of tone, it is essential to work in as bright a light as possible, and this should be yellow in colour and not orange. The necessity of using such a light with care need not be stressed here. The depth must be judged on the *fixed* print, and not while it is still in the developer. *It is a good idea to retain the fixed trial strips* for experiments at the soaking stage to determine, in advance, the best conditions for inking, without experimenting on a valuable print itself.

Fixing, Washing and Drying. The fixing bath to be employed in connection with prints to be used for bromoil, should, in the opinion of the author, be a plain 10% hypo solution. Some eminent authorities, including Dr. Meyer, advocate an acid hypo of the kind made by adding potassium metabisulphite to the plain hypo solution. It is difficult to see why there should be any theoretical objection to this although the degree of swelling may, of course, be affected; but, nevertheless, the author has found a number of cases of reversal in inking following such a fixing bath, whereas

the plain hypo bath has never given anything but satisfaction. Possibly it is more important to use acid hypo in conjunction with M–Q developer or others with strongly alkaline accelerators, so that development is retarded at once on entering the hypo solution, and the risk of staining is diminished. With amidol, of course, there is no staining tendency, and even with M–Q staining will not occur, except in the hottest weather, if the prints are pushed well under the surface of the fixing bath and kept in motion for a few minutes. *It is, in any case, most important to keep all prints intended for bromoil totally immersed, and preferably on the move at all stages of the preparatory operations.*

While it is sufficient with a silver print to see that no damage to the silver image takes place, in a print intended for bromoil, the gelatine coating itself has to be protected—a much more difficult thing. It is important to realise that throughout all operations, every square inch of the surface of the print must be treated precisely as all the remainder of the surface. No part must be allowed to buckle and rise above the surface of the solutions and washing waters, and during drying excess moisture must not be allowed to stand about in blobs on the surface, or unevenness will result in the final inking. This maintenance of absolutely equalised treatment is important at the present stage of operations, but is much more so after bleaching and tanning.

The washing after fixing must be very thorough, as even slight traces of hypo left in the print will markedly affect the tanning bath, and may lead to general tanning of the image, or in some cases, reversal during inking. If running water be employed it is preferable to allow washing to proceed for two hours; generally, however, the change procedure is more certain if more laborious. About 15 changes, with adequate draining in between, should suffice to make a good job of the hypo elimination. After washing, prints may be tanned and bleached right away, or may be dried first. On the score of convenience many workers will prefer to dry, and bleach on a subsequent occasion.

In drying, it is necessary to observe several precautions. As stated above, every part of the surface of the print

must receive absolutely equal treatment, or differential swelling may be set up, which will lead to irregularities in inking. The only permissible irregularities are those conditioned by the original silver image. All other sources of varied water-absorption must be ruled out. In general, drying must not be too rapid, or a permanent contraction of the gelatine may sometimes take place, which leads to difficulties in subsequent swelling. Localised hot air currents must be excluded, and direct sun should not be allowed to impinge on the prints. The best method to adopt is to allow the prints to drain well after removing from the washing water, and then to hang them up on a line by means of spring clips (small spring clothes pegs do excellently) from one corner. They should be about one foot apart. If desired, the excess moisture may be first dabbed off with a wad of fluffless linen. Wiping of any description is to be avoided. If they are taken when dry to the touch but not quite bone dry, they remain flat, and can be very easily handled when the bleaching and tanning is proceeded with.

Points and Precautions from Chapter I

(1) As far as possible use a soft negative.—About three-quarters normal development time.
(2) At all stages keep to one set of time and temperature conditions for the most constant final results.
(3) Amidol is the best developer—see formula and suggested factors.
(4) Factorial development of the bromide print is a *sine qua non*. If necessary, reduce contrast by decreasing the factor, but do not overdo this.
(5) Use all solutions once and once only.
(6) Retain the trial strips for bleaching and tanning to act as experimental strips for inking.
(7) Soak and dry prints so that all the surface receives equal treatment.
(8) Fix and wash with especial thoroughness.