

PRACTICAL
TRADE MARK
PHOTOGRAPHY



**A MANUAL OF
BROMOIL AND
TRANSFER**

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PRACTICAL PHOTOGRAPHY, NO. 12

A MANUAL OF
Bromoil & Transfer

BY

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INTRODUCTION

Twenty years have passed since the bromoil process was discovered and named by English workers. Possessing points of similarity to the previously introduced oil process, it also had many distinct advantages over the latter.

Of recent years bromoil has become increasingly popular, until today it bids fair to be the premier method of pictorial rendering, preëminent by reason of its many virtues. In the beginning it appears to have been imperfectly understood. True, some were apparently able to overcome the inherent difficulties more or less successfully, but the great majority seemed unable to cope with the multiplicity of problems and fell by the wayside. Thus bromoil gained the reputation of being a decidedly uncertain, tricky process.

Perhaps this was largely due to the fact that the earlier exemplifiers of bromoil printing were working empirically; the available information was wholly inadequate, and frequently contradictory.

It thus remained for the individual to try to work out his own method, and few seemed able to carry on to a consistently successful conclusion.

Much good work was done however, by certain pioneers, so that gradually there evolved as a result of the continuous study and experiment on their part, a knowledge of the principles and their relations.

Among the early workers, Dr. Emil Mayer of Vienna recognized the value and beauty of this highly flexible process. With the characteristic persistence of the scientist he spent many years in untiring experiment as a result of which he succeeded in standardizing the procedure, and — even more important — the materials themselves. For here had always existed a weak link. The worker was wholly dependent upon his materials, largely makeshift and varying greatly in their suitability for the purpose.

The earliest edition of his classic work "Bromoil Printing and Bromoil Transfer," published in 1913, contained the first complete exposition of this standardized method, presenting a straightforward procedure, without variation, taking the reader along, step by step, with detailed directions, in place of the former involved and often contradictory statement.

The following manual is offered as the most recent authoritative condensed work by Dr. Emil Mayer, whose brilliant precept and example has so largely contributed to destroying former uncertainty, dissipating prejudice, and serving to bring forth to their own well-deserved place in the sun that beautiful pair, bromoil and its transfer.

The translator is an old friend and pupil of the author. The valuable notes furnished by him are the results of his experience in coöperation with many American workers.

These notes afford a more intimate application of Dr. Mayer's methods to local conditions.

FLOYD EUGENE VAIL

New York, January, 1927.

PREFACE BY THE AUTHOR

Complying with many requests, I have prepared a manual for self-instruction in bromoil printing and bromoil transfer. This manual contains in brief and yet ample form, all that the beginner should know, and it calls attention to the errors which may occur. With some diligence and attention anyone will be able to take up bromoil printing and to lift himself from the routine type of photography to those artistic effects which the bromoil process affords.

For later and more thorough study, the reader is referred to my book on "Bromoil Printing and Bromoil Transfer," which has been translated by Mr. Frank Roy Fraprie, F. R. P. S., and published by the American Photographic Publishing Company of Boston, Massachusetts.

Remarks by the Translator. — The fascinating bromoil process has evidently captivated most of the renowned exhibition workers. Recent salons and exhibitions present a great number of bromoil and bromoil transfer prints. Professional photographers of continental Europe have made bromoil prints a successful offering to their clients who desire at least one print of a set to be permanent and superior.

The wide opportunities for control and individual expression afforded more especially by multiple bromoil transfer, and at the same time, the ease and sim-

plicity of the manipulation, will create permanent friends among earnest workers.

Now, since inventions and preparations by Dr. E. Mayer provide absolutely reliable materials and accessories for the process, simplifying and harmonizing the work, and removing the great disappointment occasioned by inadequate material, it is within the scope of everybody to produce satisfactory bromoil prints and transfers.

PART I.

BROMOIL PRINTING

The Genesis of the Bromoil Print. — The base for the preparation of a bromoil print is a bromide print, which may be produced either by contact or by enlargement. As a rule enlargements are employed because one of the great advantages of the bromoil process is to make unnecessary the intermediate steps, like the making of diapositives or enlarged negatives, etc., which are required with many other printing processes, such as gum printing or pigment printing. A bromide print consists of paper coated with gelatine emulsion, wherein the picture is formed by the deposit of microscopic particles of metallic silver. In places where silver occurs in large quantity, shadows are represented; where there is less, intermediate tones are created; and where there is none at all the pure white highlights of the picture appear. In the bromide print, visible effects are produced by a very small silver deposit; therefore a section of the picture will appear distinctly gray, although only a comparatively small amount of silver may be present in that particular section.

The preparation of a bromide print for bromoil consists of completely removing the metallic silver

from the emulsion by a bleaching process. Concurrent with this removal of the silver, a tanning of the gelatine takes place and the intensity of the tanning depends upon the amount of silver deposit present in each part of the picture; the more silver is dissolved during the bleaching process, the more thorough the tanning of the gelatine is in that place. Therefore the deepest shadows undergo an extreme hardening; darker middle tones are hardened somewhat less; the gelatine in the highlights, which have no silver deposit at all, remains unaffected. Places of the picture which show a barely visible gray tone will correspondingly be very little hardened and differ very little in this respect from the highest lights, which are entirely free from silver.

In place of the vanished bromsilver picture, the emulsion now contains a tanned image which is invisible or only barely discernible, and which becomes apparent only when the thus prepared print is immersed in water for swelling. Then the characteristics which the gelatine acquired through bleaching become visible. The shadows, which are the most hardened parts of the gelatine emulsion, have lost completely, through tanning, the capacity to absorb water; those parts of the gelatine which correspond to the highest lights and which remain unaffected by tanning, lost nothing of the property of gelatine of swelling in water; the intermediate tones, which range between the highest lights and the deepest shadows, swell proportionately to the quantity of silver which they contained. When the bleached bromide is immersed in water, the highest lights, which are not tanned at all, absorb water eagerly and

the gelatine swells; the deepest shadows do not take up water, because of the tanning, and remain low; the middle tones swell proportionately. The result of the swelling is a relief which is usually quite visible.

Oil pigment, when applied to such a relief, is repelled completely by the swollen, water-soaked places of the gelatine, the highlights; the strongly tanned deepest shadows take the pigment easily, and the intermediate tones act in accordance with their respective degree of tanning, which implies that they take more pigment where they were originally darker, and, therefore tanned more effectively, and they take less pigment where they approach the highlights.

The Bromide Print. — The bromide print, upon which bromoil is based, *should be as perfect as possible*. A certain minimum of metallic silver is necessary to produce the tanning action in the gelatine emulsion. Therefore satisfactory results are unlikely from too thin prints or from altogether too delicate sections of otherwise rich prints; but likewise an excessive silver deposit in bromide prints is disadvantageous. Efforts must be made to secure the most perfect bromide print, wherein the highlights are as clean as permitted by the silver deposit of the negative and wherein the shadows are luminous and not jet black and heavy.

Whoever attempts the bromoil process must be completely conversant with the technic of bromide printing. It is within the scope of bromoil printing, and one of its outstanding advantages, that it permits far-reaching alterations in the gradation of the basic bromide print. But this is limited by the fact that it is not possible to reproduce details which

barely appear in the bromide print; nor can it be expected that clogged shadows will be improved materially, because no differential tanning occurs between dark gray and black tones, wherefore pigmenting will show no variations of gradation. The beginner in bromoil printing should select for his first attempts only the most perfect and harmonious negatives, because from such negatives it is easiest to secure bromide prints which correspond to the aforesaid conditions. It is reserved to the experienced bromoil printer to apply his technic to the improvement of difficult negatives.

Choice of Paper. — The gelatine emulsion of a bromide paper intended for bromoil printing must be able to swell sufficiently and yet should not be too soft; on the other hand, the emulsion should accept the pigment easily and readily and should yield it again under the conditions of the transfer process. Papers which are strongly hardened during manufacture, are, therefore, not usable. On such papers a satisfactory differentiation of swelling cannot be produced after bleaching. Only a practical test will demonstrate whether a bromide paper is fit for bromoil printing. This test consists of producing a good bromide print, treating it according to rule and then applying pigment. If, on a correctly prepared paper and after sufficient swelling, the picture does not appear immediately and easily under the brush, then doubt will exist as to the availability of that paper. It is regrettable that there is no simpler method of testing; but it must be remembered that the foundation of the entire process is the ability of the gelatine to reproduce differences of swelling. Now, the char-

acteristics of gelatine are not well understood, as colloid research has but recently approached this very difficult subject. One thing can be said with certainty: if a bromoil print fails, notwithstanding careful and conscientious preparation, or if it offers difficulties, then the reason is an unsuitable gelatine emulsion.

The great popularity of the process at present has induced some prominent manufacturers of bromide papers to attempt the production of specific bromoil papers, wherefore it can be surmised that the difficulties due to the material will soon be completely removed.

Gaslight papers (chloro-bromide papers) are, on general principles, just as usable for the process as bromide papers. With them also the picture consists of metallic silver which is imbedded in the gelatine solution. Naturally papers of all kinds of surface and color can be used. The elastic brushes overcome without difficulty the roughness of the surface.

The Development of the Bromide.—The greatest effort must be made to secure from the negative a print of great clearness and modulation. This requires the most accurate determination of the necessary printing or enlarging exposure time. The difficulties which were hitherto connected with this operation have been overcome by the introduction of the "Dremmeter," which the author invented for the practical gauging of exposure for development papers. This exposure gauge indicates, with unfailing certainty, and by means of a single exposure on a trial strip, the correct printing time, thereby obviating disappointment and waste of material.

Any of the usual developers may be used. Likewise for the fixing bath, no particular precaution need be observed, except that acid alum hardening in fixing solutions cannot be employed, because the hardening would interfere with the subsequent swelling. Each one may work with the developer to which he is accustomed; satisfactory results may be obtained with any developer which is skillfully employed.

[Since writing this manual, Dr. E. Mayer has communicated the following general formulas, which are also particularly adapted for the Drem Bromoil paper, which is manufactured and tested under his personal supervision:

M. Q. Developer; Stock Solution

Metol or Elon	3 g	23 gr.
Sodium sulphite, dry	40 g	307 gr.
Hydrochinon	6 g	46 gr.
Sodium carbonate, dry	30 g	230 gr.
Potassium bromide, 10% solution	5 ccm	38 minims
Water to	1000 ccm	16 oz.

For use, dilute one part of stock solution with two parts water.

Amidol Developer

Water to	1000 ccm	16 oz.
Sodium sulphite, dry	10 g	77 gr.
Amidol	2 g	15 gr.
Potassium bromide, 10% solution	2 ccm	15 minims

For greater convenience, and avoidance of weighing, bottles and disintegrating chemicals, Dr. Mayer provides a Drem Special developer in cartridge form. This developer has diamidophenol as active reagent, and is excellent for securing prints suited for the bromoil process.—*Note by the Translator.*]

The following is a very important rule: Expose and develop to produce a bromide print which appears

somewhat flat, but with plenty of detail, absolutely clean highlights and even the deepest shadows only gray in tone.

Fixing Bath

Water to.....	1000 ccm	20 oz.
Hypo	200 g	4 oz.
Potassium metabisulphite	12 g	$\frac{1}{4}$ oz.

[The metabisulphite should be added only when the hypo solution is cool. — *Note by the Translator.*]

Correct exposure and development of the bromide are judged by holding it in the darkroom before the red or dark yellow safe light, whereupon it should show the same density in transmitted light as by surface inspection in reflected light. If the print appears flat when looking through it, then the exposure was too long and development must be stopped prematurely. It is possible to secure usable prints with overexposure and short development. With contrasty negatives, the abbreviated development may be even advantageous, because it prevents superfluous silver deposit in the deep shadows.

Heavy clogging of the shadows is not only detrimental on account of the obliteration of details, but also because such places offer difficulties during bleaching. Due to the great quantity of silver to be dissolved, the bleaching process progresses only slowly; frequently most of the picture is completely bleached, while the shadows resist for a long time. This retards the bleaching process unnecessarily without gain for the bromoil print. *The maximum tanning of the gelatine emulsion is reached with a much smaller silver deposit* so that additional silver is not conducive to further differentiation of tanning. It is

sufficient and advisable that the darkest shadows show a deep gray only. Black shadows are not detrimental if details therein are clearly rendered.

Very heavy silver deposits in the shadows have still another effect. In such places, after completion of the bleaching, a gray to yellow discoloration of the gelatine remains, although the entire metallic deposit has been removed. In prints from negatives with little contrast, it is possible to count upon complete disappearance of the picture after bleaching, but in contrasty bromide prints the picture remains faintly visible, at least in the deepest shadows. This is of no consequence if all of the picture surface is later pigmented, but disturbing if it is intended to produce a sketchy representation of certain parts of the print, whereas other places are to remain unpigmented, as, for instance, to secure vignetted effects.

Fog, of whatever origin, must be avoided. It makes no difference what causes such fog, which may be due to any of the following reasons: the bromide paper may be affected by age or chemical influences; there may have been severe overexposure; the paper may have been exposed to unsafe darkroom light or be otherwise light-struck; or it may be a chemical fog due to improperly composed developer or prolonged development. Fogging always means the creation of a silver deposit in places where it does not belong. During the bleaching process the tanning action produced by the metallic silver, which is due to fog, is just as pronounced as the action of such silver properly appertaining to the picture itself, and, therefore, the result is unfavorably influenced. Sometimes it is possible to achieve complete clearing of slightly fogged

prints by a proportionately higher swelling; but it is always better to avoid errors than to attempt subsequent improvements.

The effort to prevent shadows from developing too heavily must not be exaggerated, because the resulting prints would be lacking in silver and therefore without contrast. *Where there is insufficient silver in the emulsion, tanning does not take place with the required intensity*, and it becomes impossible to secure a sufficient relief. Delicate high-key bromide prints are sometimes quite appealing, but they are usually very disappointing if used as a basis for a bromoil print. Try to secure from the negative the best possible bromide, and do not rely upon the possibility of improving an unsatisfactory print by the bromoil process.

The possibility of influencing a bromoil print is fully utilized if the bromide print is perfect, but a part of the latitude allowed by the bromoil process is wasted, if it is required to counteract errors in the original bromide. Not every negative furnishes suitable prints and there are occasions where a correction of the negative is difficult or must be avoided for other reasons. In such cases it is obviously necessary to provide all required improvements during the making of the bromide print.

To make soft prints from hard negatives, give a very full exposure and develop in a much diluted developer. This easily gives soft prints from contrasty negatives; if the color of the silver deposit is unpleasant, it is of no consequence, because the silver disappears in bleaching.

Contrasty prints from soft negatives are produced by adding plenty of potassium bromide to the developer, but the influence of this chemical is rather limited. It is quite true that the prints are clearer and have greater contrast, but the gradation of a bromide paper cannot be extended beyond certain rather narrow limits. Any attempt to go beyond these limits occasions fog. Extensive changes of the gradation must generally be made by suitable treatment of the negative, as for instance, by intensifying.

Regarding the development of bromides it may be remarked that intermittent development is very advantageous. Development proceeds in the usual manner until the picture is clearly discernible; at this stage the print is removed from the developer and immersed in a tray of water, where only such developer continues to work as has been retained and carried over in the emulsion. After a while the print is taken from the water and returned for a brief period to the developer; the procedure is repeated until the desired result is accomplished. This method permits considerable control, development can be influenced locally, and it avoids chemical fog, which is likely to occur from prolonged immersion in the full-strength developer.

After the usual fixation of the developed print, *it is necessary to wash thoroughly*. Hypo in the emulsion makes the bleaching process very difficult. Drying of the print after this stage is recommended, but it is not absolutely required. The bleaching can take place immediately after washing.

This so-called abbreviated process, which consists

in bleaching the prints in the darkroom immediately after development, and then placing them in the hypo for fixation, leads mostly to failures.

The Bleaching. — The function of bleaching has been explained. Since the first publication of the author's bleacher in 1911, various formulas have been recommended by others which differed therefrom; but none of the changes proved to be a betterment. This bleacher is the following:

A.	Copper sulphate	20 g	1 oz.
	Water	100 ccm	5 oz.
B.	Potassium bromide	20 g	1 oz.
	Water	100 ccm	5 oz.
C.	Potassium bichromate	10 g	$\frac{1}{2}$ oz.
	Water	100 ccm	5 oz.

For use, take:

Stock Solution A.....	45 ccm	3 oz.
Stock Solution B	45 ccm	3 oz.
Stock Solution C	15 ccm	1 oz.
Hydrochloric acid, C. P.	1 ccm	20 minims
Water	200 ccm	15 oz.

This bleacher is permanent in concentrated as well as in diluted form. It is necessary to compound the formula accurately, because otherwise the bleaching may appear to take place normally, but may not produce the required selective tanning. The users are cautioned against warming of the bleacher and against addition of too much hydrochloric acid, because in either case the bleaching will be accelerated, but the result will be jeopardized.

Recently a bleaching powder preparation has been marketed under the trade name of the author ("Drem") in cartridge form. This bleaching compound saves time in preparing the several stock solutions of slowly dissolving chemicals and produces

almost instantly a bleacher which protects the gelatine emulsion and is, therefore, useful with such papers as have offered some difficulties before. The conditioning of prints by this new bleacher is more perfect and rapid.

Bleaching is carried out in the following manner: the bromide prints are placed in cold water until limp, then they are immersed in the bleaching solution and grow fainter until finally the gray color of the silver deposit changes to a light yellow, beginning with the half tones and progressing to the shadows. It has been mentioned already that the bleaching of too heavy shadows takes considerable time.

It is permissible to bleach a number of bromide prints in one tray at the same time, but it is then necessary to keep the prints in motion and to lift them out from time to time for inspection. In places where air bubbles occur, black spots remain, but these disappear after breaking of the bubbles and continued immersion; the same occurs in places where the prints touched and where the access of bleaching solution was temporarily impeded.

If prints do not bleach after immersion in the bleacher, but only change to a brown color, which may occur over the entire print or only in certain places, the reason must be ascribed to insufficient removal of the hypo from the emulsion. In most cases this brown discoloration disappears in the hypo bath which follows the bleaching. Detrimental consequences for the bromoil are unlikely, but may occur. If the bleaching progresses too slowly when manipulating a number of prints at the same time or in re-employment of used bleaching solution, fresh solu-

tion has to be added. Generally it is recommended to work with fresh bleacher. Bleaching may be conducted unhesitatingly in full daylight.

Bleached prints show the picture in a dark yellow tone on a light yellow background. They are rinsed in several changes of water until the water ceases to show yellow stain and are then placed for about fifteen minutes in the usual acidulated hypo bath.

Water	1000 ccm	20 oz.
Hypo	200 g	4 oz.
Potassium metabisulphite	12 g	$\frac{1}{2}$ oz.

In the hypo the yellow discoloration of the emulsion disappears and the picture becomes invisible or only faintly visible in places where heavy silver deposits were present.

The use of rapid fixing solutions is not advisable. The hypo bath removes the secondary silver image created during bleaching. Omission of the hypo bath would cause the entire picture to reappear later on.

After fixation the prints are washed in the usual way, but painstaking removal of the hypo is not necessary at this stage, because it cannot be harmful to the further manipulation.

It is very important to dry the prints at this stage. Omission of the drying may lead to various failures and may even make it impossible to ink up. Drying should never be accelerated by heat, and the prints are not to be dried near a heating appliance or in the sun. After the bleaching, the wet emulsion is capable of swelling and heat would produce an uncontrollable relief. After drying by heat the prints are mostly over-swollen and unfit for use. To dry quickly, remove surplus water from both sides of the print by

blotting with lintless filter or blotting paper, and dry in normal temperature and, if possible, expose to air currents.

[A discussion of the bleaching manipulation with Dr. Mayer furnished additional instructions which apply more especially to American conditions. The presence of even a very small amount of iron in the bleacher causes chemical reactions which have a general tanning effect, quite overwhelming the intended differential hardening. Iron may be introduced by impure chemicals, particularly the copper sulphate.

The interior plumbing of our domiciles is mostly iron piping and the water used for washing may carry a large amount of fine iron rust particles which form a sediment and become imbedded in the emulsion. Even swabbing of the prints will not remove all of it. This iron then reacts in the bleacher. Filters are obtainable in every hardware store which will hold back these sediments if clamped to the washwater faucets.

A very common source of iron contamination is the use of enameled trays, which invariably show cracks or even chipped places, exposing the underlying iron to the bleaching solution. For this stage of the process, and even for the washing after bleaching, the use of hard rubber, glass or porcelain trays is urgently suggested. Many complaints about improper tanning have been traced to the deleterious presence of iron. — *Translator.*]

The Swelling. — The application of oily pigment to the print, the inking-up, requires an adequate swelling or relief, obtained by immersion of the bleached print in a water bath of properly regulated temperature. There are no standard rules for the temperature of

this bath; each case has to be treated empirically, by progressive trial. The temperature depends upon the specific qualities of the paper and the amount of the original silver deposit. Occasionally prints show a marked relief even in cold water, but it may not suffice for the production of a good bromoil. In such cases it is frequently necessary to employ a warmer bath to improve the relief.

The relief is judged by inspection of the surface-dried print in oblique light. Application of pigment can be attempted, if distinct swelling differences are discernible. *The relief is suitable if the picture appears immediately and easily in contrasty places while using the brush and hard pigment.* If this is not the case, and if the pigment covers all of the trial section without rapidly showing distinct differentiation between lights and shadow during the distribution of the pigment by the brush action, then the swelling is insufficient and the print requires a bath of higher temperature. It is advisable to increase the temperature by 10° F. after each unsuccessful trial, until the desired result appears. *The use of a thermometer is indispensable.*

[Dr. Mayer suggested also the *Touch Method* for approximate appraisal of the relief condition. Experienced workers will soon be able to determine in this manner quite accurately when the proper swelling has been obtained. Passing the finger tips gently over the immersed emulsion creates the sensation of a certain roughness, or graininess, like very fine sandpaper in places of deep shadows, and of slippery, jelly-like smoothness in highlight sections, and particularly on the clear safe-edge, which should be provided on

all bromoil prints for several reasons. This test indicates to advanced bromoilists that the swelling relief has reached the condition where it should be verified under the brush.

Beginners are urged to proceed by progressive trial, and actual inking-up tests, starting with cold water.

The average minimum swelling temperature of papers specially designed for Bromoil work is about 60° F. "Drem" Bromoil paper, which is tested by Dr. Mayer personally, indicates the minimum swelling temperature on each package, usually 86° F. "Drem" strives for high minimum swelling temperature to prevent over-swelling during the recommended drying after bleaching in warm rooms or in summer heat. Long soaking in cold water may have the same effect as short immersion in a properly warmed bath. The relief appears more pronounced in prints after transfer. The highest temperature employed determines the degree of swelling, and immersion in cold water, even after prior drying, will invariably reproduce the maximum relief once obtained. The initial swelling should be appropriate for the hardest ink available. Modifications will be discussed later. —*Translator.*]

No upper limit for the temperature can be indicated. Papers which were subjected to a hardening process during manufacture will produce a desirable relief only at very high temperature. It is useless to start work before a trial has demonstrated the prompt appearance of the picture under the brush.

The inking-up will be successful only if it takes place easily. The pigmenting of a properly conditioned print, brought to a correct degree of swelling, must take place without difficulty. The necessity of labo-

rious and prolonged dabbing indicates some error: unsuitable emulsion, oversight during preparation, inadequate swelling.

This should not convey the impression that the making of a bromoil print is necessarily an easy and effortless manipulation; it only implies that the general application of the pigment should not cause difficulty. Care and painstaking toil are rather to be applied to the detail work, especially to the control of the tonal values.

This stage of the process decides with certainty the suitability of a bromide paper for bromoil. The test presupposes a correct bromide print, from a good and harmonious negative.

When working with a familiar paper of uniform emulsion and analogous negatives, the print can be placed unhesitatingly into water of temperature known to provide at once the most suitable degree of swelling; otherwise it is preferable to increase the temperature by steps until the correct swelling prevails.

The relief is not always visible; a print from a negative without particular density differences may be well and easily workable, in the absence of a noticeable relief.

The employment of too warm water causes over-swelling of the emulsion. In this case the highlights and halftones are raised too high, and repel the pigment, only the deepest shadows accepting the ink. Such a print must be abandoned as useless.

Care should be taken to immerse the print completely and that no part remains dry, because in such parts swelling would not occur. If air bubbles occur, the inking-up will cause dark spots, because the emulsion

had no opportunity to swell and remained low, acting like shadows.

If warm water should not be available, then swelling can be produced by a very weak, hardly perceptible *solution of ammonia* (just a few drops in a tray of water). This remedy acts very energetically, is likely to produce overswelling, and should, therefore, be employed very sparingly and cautiously.

Utensils. — *Brushes.* — Use the well-known stag's foot shaped bromoil brushes with working surface cut on the slant, and from one-half to one inch in diameter. Larger brushes are more easy to work with and produce a finer finish when broad masses are being dealt with. For confined areas a brush of about one-quarter inch diameter will be practical. The brushes may be made of fitch hairs or bristles sharpened to a fine tapering point. Only brushes of reputed and well-tried make should be employed.

[Dr. Mayer decided after many experiments to devise the type of bromoil brushes now available. They are stagfoot shaped, composed of a special kind of select bristles, and bound in quill in such a manner that every hair retains its long, natural point; these brushes are very elastic, non-curling, of even working surface, assembled to shape and not merely ground to dome shape after binding. — *Translator.*]

Cleaning of brushes. — Brushes should be cleaned as soon as possible after work, to prevent the ink from becoming resinous in the brush. Use for this purpose a very volatile fat solvent, preferably benzine, but do not use spirits of turpentine. Cleaning with *soap and water is not recommended*, because it softens the hairs too much. Either dip the brush into benzine and

eject the liquid by a hurling motion, or, preferably, hold the brush with the hairs pointing up, pour in some benzine and wipe the brush dry on a lintless cloth.

[The use of benzine, gasoline, or any other inflammable substances must be earnestly discouraged. Carbon tetrachloride is not inflammable and is a very effective and quite economical solvent. A similar substance is obtainable commercially in most drug stores under the trade name of Carbona. Turn the brush up and slightly compress the bristles in the annular opening formed by crooking the thumb and index finger of one hand and pour on a few drops of Carbona. Then wipe the brush dry on lintless cloth or newspaper and finally eject the remaining liquid by a jerking motion of the brush. Carbon tetrachloride evaporates instantly, leaving the brush dry and the resiliency of the hairs unimpaired. — *Translator.*]

Pigments. — For best results use only bromoil pigments and inks of reliable makers. Regarding consistency of the ink, the following applies: Extremely hard preparations are useless for bromoil work because they require thinning. The prepared pigments should have the consistency of table butter in normal temperature, so as to spread without application of great pressure. This degree of consistency permits of filling the ink into collapsible tubes, which are clean, convenient, handy and prevent resinous hardening of the preparation. Moreover, the inks are required to work limpidly. Some inks work smeary, although of proper consistency.

When high swelling of a print necessitates the use of *soft ink*, then the worker may prepare it himself by

mixing with the ink a little linseed oil (printer's varnish) or some other thinner of similar base.

[Dr. Mayer has discussed bromoil inks in recent correspondence, and referred to two categories. One kind is of an oily base, similar to lithographic inks, like the good Sinclair oil pigments. They dry very slowly and with considerable gloss in the heavily pigmented shadows. The other kind, represented by the "Drem" pigments, is of a waxy, encaustic base, causing the prints to dry very soon after completion and even the shadows show much less gloss.

Either manufacturer furnishes also a special thinner, called "medium," which is closely correlated to the specific ink compound; very small additions of medium to the ink produce marked softening. Medium has sometimes the tendency to make the ink less limpid and light tones rather cloudy. Dr. Mayer recently devised his Novomedium, which permits the addition of liberal quantities to the ink without undue softening of its consistency, yet retaining the original brilliancy. Bromoil inks are to be judged not only by the manner in which they ink up, but also by their results in transfer.

Novomedium is used to make bromoil pigments pliable and softer. If a bromoil repels normal ink partly or wholly, or if the ink re-enters the brush during stippling, then use first Novomedium, by blending a small quantity of pigment with about half its volume of Novomedium on the palette. If necessary, this quantity may be increased. Novomedium not only makes the pigment very pliable but it also retains the luminosity while achieving a velvety matt surface.

Dremmedium is employed, if the pigment does not

adhere sufficiently to the bromoil even after ample use of Novomedium. In such case use a *very small* quantity of Dremmedium, which will thin the ink very much, and make it adhere in any place. Excessive use of Dremmedium causes cloudy prints. — *Translator.*]

Palettes. — For the spreading of ink a porcelain palette is useful. It has the advantage of being easily cleaned with a little benzine or spirits of turpentine. [Use rather carbon tetrachloride or Carbona — *Translator.*] Another very practical palette is a pad of several layers of glazed parchment paper. Removal of the used top sheet makes the next fresh spreading surface ready. The glass side of old negatives can be utilized, of course.

The ink is spread thinly and evenly with a knife, palette knife or spatula; a thick layer is unsuitable because the brush may fill up with too much ink.

If there is sufficient pigment left on the palette after completion of the work, it can be preserved for the next occasion by pressing a piece of parchment paper upon the batch. Exposure to air without protection usually causes resinous hardening of the ink.

Support. — The print is supported on a drawing-board or glass plate, inclined at an angle of about 25 degrees. Upon this support spread an intermediate substance, for instance, one of those sheets used as moisture carrier with letter copying presses, composed of two linen sheets separated by a layer of rubber. This intermediate support should be moistened on both sides, so as to adhere to the supporting board itself and cause the print to adhere to it in turn.

It is *not* its function to keep the print moist during

the work; to convey sufficient moisture to the emulsion through the underlying paper base is quite impossible. One or more layers of linen are also acceptable as intermediate support, if they are moist and spread without folds or blisters.

Refrain absolutely from the use of blotting or filter paper for intermediate support, because the brush, applied beyond the edge of the print, picks up paper fibres and water drops and carries them onto the bromoil.

After all, the intermediate layer is not indispensable; the print can be worked directly on the supporting board or glass plate.

Surface Drying of the Print. — After the print is placed upon the support, special attention should be given to the surface drying. It is imperative to use for the drying a material which is positively lintless. For this purpose old and repeatedly laundered linen is the best. Should such material be unavailable, then good copperplate printing paper will be of assistance because it is very absorbent, lintless and can be used repeatedly after drying. Other textile materials than well-washed linen are to be strictly avoided. They deposit on the viscous emulsion an endless number of the finest fibres which are invisible in the beginning but later absorb ink, whereupon they appear in form of an incalculable number of small dots or twisted lines. For a long time it was erroneously supposed that these impurities were carried onto the bromoil by the brush. They are caused by the brush only if the latter has been wiped on a linty material after cleaning. It is necessary to inspect the print in a light striking the surface obliquely to

make certain that the surface water has been completely removed from the emulsion. Remaining water drops cause white spots which change location frequently under the brush action.

Caution is necessary in drying an already pigmented and re-soaked print, to prevent unnecessary disturbance of the pigment already applied.

The Inking. — A little pigment is taken up by the point of the knife or spatula and spread evenly upon the palette, to form a layer not more than $1/32$ inch thick. Some of this ink is taken up again with the spatula, mixed on another place of the palette with a very small quantity of Novomedium or medium and spread likewise very evenly and thinly. This makes hard and soft ink available.

The brush is now set upon the hard ink and dabbed out repeatedly upon a clean section of the palette. *Never pass directly from the ink to the print*, because heavy pigment particles would be deposited which are difficult to distribute and have to be removed.

After the pigment appears well distributed over the working surface of the brush, the manipulation is as follows: If the brush is placed upon the print rather energetically and lifted slowly, it will deposit ink. This deposit is distributed and lifted from the highlights by repeated resilient dabs with the brush. It is dependent upon manual technique and guided by the fact that *the more lightly the brush is operated the more effectively it works*.

At this time it may be mentioned that the general inking-up of a bromoil print should be easy and rapid after some preliminary experience. If this is not the case, it may be deduced that the paper is unsuited,

or the conditioning defective, or the swelling insufficient. Work is started by a delicate application of ink upon a contrasty section of the print, and the pigment is distributed at once. The picture should appear quickly though faintly from the start. Light application of ink is then continued on the adjacent sections, until the entire picture appears.

Never abandon an uncompleted place, to work upon another; ink-up continuously. A good survey of the complete picture can be had after the preliminary light inking, enabling selective domination of the tonal values, by inking-up gradually those places which require strengthening. This will gradually procure the intended effect, and complete the bromoil.

Every application of the brush should convey additional pigment to the print. If this is not taking place, it will be necessary to investigate whether surplus pigment still adheres to the place of the palette from which ink is being taken. It is equally wrong to surcharge the brush too heavily with ink, because the print will suffer. Therefore keep the pigment thinly spread and well distributed in the brush before its application to the emulsion. Should the print release ink back into the brush during the dabbing action, or accept ink reluctantly, then *the ink is too hard for the degree of swelling.* In this case the ink needs thinning, which is effected in the following manner: Hard ink is taken up by the brush and dabbed out thoroughly upon a clean place of the palette. Dip the toe of the brush into soft ink and dab it upon the same place. This produces a very uniform and easily controllable softening of the ink. The proper consist-

ency is tested by renewed inking-up and eventually corrected by further thinning.

To change the color of the ink in use, intermix different pigments, preferably in the manner suggested for the blending of hard and soft ink.

To remove surplus pigment from overinked places, a paper of the approximate shape is placed upon the faulty section, rubbed down with the finger tip and lifted. Surplus pigment will be removed thereby and the place can be worked over unhesitatingly. Mastic rubber, kneaded into suitable shape, will remove pigment from restricted areas. Repeated application of mastic rubber to the same place will cause blisters. It is better to use a moistened *stump of blotting paper* for the removal of ink, especially from the highlights.

Over-inking of the entire print is corrected by complete removal of the pigment with a wad of cotton, dipped into benzine or Carbona.

As a rule the entire surface of the brush is utilized while working. For the treatment of very small areas only the point may be used alone. The brush should never be operated against the toe, because then the long bristles would bend and make sharply outlined pigment marks. To cover large areas the brush is advanced slowly and lifted slightly without ever completely losing contact with the print surface. *Shadows, especially if they are very dark, should be treated with great caution*, because they are easily surfeited with ink. Therefore, when passing the brush from the palette to the print, *never pass to the shadows directly, but work first on lights and halftones*. After desired details become clearly visible in the shadows, a stronger inking can take place. It is the rule that

shadow details must be brought out by restrained inking, because they would be submerged by initial heavy pigmentation. This condition may be utilized, though, to suppress details. *The highlights can be denuded of ink by a sweeping action of the brush.*

It is not always easy for the beginner to determine when the inking is completed. A delicately inked-up picture frequently looks very appealing, but does not satisfy ultimately, unless the delicacy was required by the character of the picture. On the other hand, pigmentation may be exaggerated, because there is practically no limit to the possibility of adding pigment. Heavy and degraded prints will result, of course. Correctness lies between these extremes, but it is of no consequence for the beginner to make deliberate or unintentional experiments to acquire experience, because a too delicate print can be intensified by continued inking and over-inked prints can be restored after removing all pigment with benzine or Carbona.

Cloud formations can be easily inserted in the sky of landscapes, though they were absent or too faint in the negative, by withholding ink from suitably shaped places during pigmentation. In case of higher swelling softer ink has to be used for the same purpose.

Resoaking During Work. — The swelling is due to the property of the gelatine to absorb water in proportion to its tanning; this relief collapses gradually and finally disappears entirely by evaporation, but restoration of the water regenerates the relief to its previous condition. A constant evaporation occurs during work; the moist support can never replace this loss of water. During prolonged manipulation, especially in

warm rooms, the evaporation is rapid; the swelling differences diminish; the shrinking highlights begin to accept ink and work becomes increasingly tedious. This is remedied by *reimmersion of the uncompleted print in water*. *Resoaking is one of the greatest aids in bromoil work and saves much manual effort*; it produces instant clearing and accentuation of the highlights. The prints should be submerged completely; where the access of water is impeded, as, for instance, by air bubbles, no swelling takes place and ink application produces dark spots. Such places are discernible by inspection of the surface-dried print in oblique light. To merely float the paper, emulsion side up, is useless. Resoaking is safest with the emulsion facing downward. At this time, impurities can be removed from the print by passing the finger tips or a cotton swab lightly over the surface. It is immaterial that the pigment layer is thereby a little interfered with, because the print has to be worked over again with the brush at any rate.

The print is removed from the water and carefully dried. The surface is first gone over with the used, but not recharged brush. After all of the print area has been attended to, regular inking-up may be continued.

Don't hesitate to resoak as frequently as difficulties arise. It will save a great deal of brush work. Resoaking also allows the making of very large prints, because drying during manipulation becomes unimportant. As a rule, cold water is used for resoaking. But should it appear during inking that the swelling is inadequate for the intended effect, it can be increased at any time by immersion in water of higher

temperature than at the start. Only a few minutes are required for the resoaking of the print in water. The thin gelatine emulsion saturates with water very quickly.

Streaks may occur on removing the print from a bath of increased temperature; this may be due to a partial removal of the medium of the ink. It is prevented by cooling the bath gradually by slow addition of cold water before removal of the print.

Faults. — *The print accepts hard ink easily, but remains cloudy even after prolonged brush work.* Cause: Insufficient degree of swelling. Remedy: Warmer water bath. If this does not improve the condition, then the emulsion is unsuited or an error occurred during preparation.

The lights repel even soft ink; the shadows accept it, but release it back into the brush during work. Cause: The print is over-swollen. This fault cannot be corrected.

Irregular spots appear during pigmenting, which attract more ink than corresponds to the picture. Causes: The emulsion is insufficiently swollen in parts, because the print protruded from the water or carried air bubbles. Remedy: This print should be resoaked for correction of the swelling. In infrequent cases spots may be due to faulty bleaching or inherent defects of the emulsion. Such prints must be discarded.

The emulsion refuses to accept ink in both the lights and shadows. Causes: Errors in conditioning, wrongly compounded bleacher, drying omitted after bleaching, but usually unsuited emulsion. Remedy: None, the print is to be discarded.

The picture appears as negative, because the lights accept more ink than the shadows. Cause: Inking-up started with far too soft ink. Remedy: Clean off with solvent and try again with ink of proper consistency.

Small, irregular white specks appear on the print, which change their location constantly during work. Cause: Water drops on the emulsion or in the brush. Remedy: Thorough surface drying, drying of the brush.

Streaks after increasing the swelling of a partly inked print. Cause: Probably removal of the medium of the ink. Remedy: Cool the water bath before removing the print.

Dots, fibres and hairs on the print. Causes: Linty or fibre-releasing material was used for print drying; the impurities become visible only after inking and are easily recognized under the magnifying glass by their contorted shapes. Impurities from the brush. Remedy: Removal of the disturbing adhesions with mastic rubber; if appearing in great numbers, swab the emulsion with cotton during immersion in water.

Local Control; Pigment Structure; Picture Character. — Bromoil is the most perfect, flexible and noble photographic art process. It elevates from the level of mechanical negative reproduction to the height of artistic activity, by permitting the free control of tonal values. Dependence upon the contour drawing is no disadvantage because it insures correctness of linear presentation. But the road to achievement is not without effort. New possibilities are of value only if usefully applied, and liberties if properly utilized. The eye as well as the hand re-

quires training, especially as the eye, our most used organ, usually lacks artistic training. Only the untrained perception enjoys the wealth of abundant details which result from mechanical reproduction of the photographic plate, and confounds individual accomplishment with the work of the mathematician who designed the lens.

Good drawing implies omission, which means that pictorial effect results only from concentrating the presentation upon the essential, enhancing of the characteristic and omitting the unimportant. All of this comes within the scope of bromoil printing. The best way to acquire the necessary knowledge and experience is to study graphic illustrations, which demonstrate what to enhance and what to neglect for artistic effect. To him who becomes cognizant of his own intentions, bromoil technique offers the medium to execute the plan conceived.

The outstanding property of the bromoil process is the inherent faculty of complete domination over the whole print, or any of its parts. It is not the sense of this process to convert a bromoil by means of a wearisome manipulation into another print, which differs from the original only by perhaps a different color or slightly steeper gradation. For such purpose it would suffice to tone the bromide print. *The essential of the bromoil process is the almost sovereign liberty in the treatment of tone values* afforded to the worker, who remains only limited by the outlines, but free to determine the tonal values by the conduct of the pigmenting. Any part of the print may be inked-up heavier or lighter than it appeared in the bromide.

The availability of *local control of any single section*

constitutes the invaluable qualification of the process. It is feasible to keep the print delicate or strong, to lighten the shadows or to increase them to great force. But all of this requires the following of a predetermined plan; the worker must know what he intends and build the bromoil to reflect his individual artistic aims. Beginners are advised to use a bromide duplicate as guide during bromoiling, to compare at any time the changes produced and their effect.

The means to execute the outlined modifications are provided mainly by the amount of pigment application and by the use of either hard or softer ink. For instance, shadows are intensified by heavier pigmentation, and glaring highlights are subdued by the use of softer ink. Clearing of lights is accomplished by a sweeping, whisking motion of the brush, or even removal of the pigment by the moistened blotting paper stump. For detail work, particularly for the pigmentation of small areas, very small brushes are employed.

Coarse-grain prints. — Thorough dabbing of the inked-up print produces almost perfect smoothness. This effect will be aimed at only in exceptional cases. The artistic effect of the finished bromoil is increased as a rule by more or less graininess of the pigment structure. It is within one's power to achieve complete clearness on a strongly swollen emulsion without advancing the ink distribution to absolute smoothness. The technique of coarse inking requires an ample pigment layer, applied by lifting the brush slowly from the emulsion, followed by a few abrupt dabs. This produces a grainy structure of the picture surface with sufficient distinctness of the outlines.

Soft ink technique. — A somewhat higher relief is inked-up with hard ink as far as possible. Work continues then with progressively softer pigment, until arriving at the desired soft and misty effect. One may also start with a print of normal swelling and increase the degree of swelling during work. Such bromoils have a particularly appealing velvety surface after defatting.

Sketches. — It is presumed that the basic bromide is not too deeply developed, and consequently shows no image traces after bleaching. Sections which are to be retained receive normal treatment, others are omitted and the ink blended into the untouched parts of the print for gradual transition.

If certain parts of the image are to be strongly enhanced, and the balance of the picture repressed to a delicate tinting, the following applies: All of the print receives first a very light inking, followed by strong pigmentation of the important parts. It may become necessary to apply a second inking to the delicate sections, should the contrast appear too great for artistic effect. This technique is suited excellently for large portrait heads.

Oil-Painting Effect. — Portraits can be made to give the effect of reproduced paintings, by inking up the head strongly, and blending in a heavy background by means of properly softened ink. Usually the head then appears somewhat light against the dark background, and requires tonal balancing. To dry such prints after resoaking necessitates gentle and cautious application of dry linen, which may be spread over the print repeatedly but always without pressure and creases; otherwise the soft ink would certainly

be lifted off again. Such prints should not be defatted and should be dried in dust-free places until the ink hardens.

White Margins. — Produce the bromide behind a suitable cut-out or mask. No attention need be paid during inking to the highly swollen clear margin. Whatever ink reaches this safe-edge can be easily removed after completion of the bromoil by wiping with the corner of a wet cloth or swab of cotton.

Defatting. — The pigment rests upon the gelatine emulsion of the finished bromoil print, consequently this is very vulnerable on the surface and cannot be touched with fingers nor pressed into a printing frame. Moreover, the bromoil shows places of varying gloss, since the shadows are very oily and the highlights quite matt. It is possible to deprive the prints of their sensitiveness and gloss by extracting the fat from the ink. This is achieved by immersing the print for a few minutes in a tray of benzine after thorough drying of the paper, but without necessarily waiting until the ink hardens. The bromoil is then removed and suspended by a corner for drying. During this manipulation the margins only should be cautiously touched, but never the picture surface itself. After evaporation of the benzine the print will have a uniformly matt surface, unless the ink contained a medium which is insoluble in benzine. At the same time with the disappearance of the gloss there is a sort of fixing of the pigment. After defatting, the print is perhaps no more sensitive than a pencil drawing. Prints made with soft ink may suffer by defatting, because a part of the soft ink dissolves in the benzine, causing streaks. A similar defect

may result even with harder inks should a more energetic solvent be employed, as for instance, trichloroethylene, or carbon tetrachloride.

[While it has been urged several times in the foregoing to substitute the unflammable and more efficient carbon tetrachloride, commercially obtainable under the trade name of Carbona, wherever Dr. Mayer suggests the use of the dangerous benzine, it must be conceded that benzine is more appropriate for defatting. Carbon tetrachloride is a too energetic solvent, frequently causing defacement of the bromoil. In this regard the Translator also takes issue with C. de Santeul, who advised the use of carbon tetrachloride in the *British Journal of Photography*, April, 1923.]

Defatting can take place at once after thorough drying of the paper, without waiting until the pigment hardens. Immerse the print with one sweep evenly and completely for about five minutes, keeping the liquid in gentle motion. Drops of benzine or incomplete immersion will cause white marks at the edges of contact. — *Translator.*]

Retouching. — A defatted bromoil is easily retouchable, because the pigment coating can be erased like pencil shading. With some skill it can be partially removed, so as to reduce heavy shadows. Two kinds of erasers are required, soft and hard, the latter being ground to a sharp point on emery paper. By a cross-hatching manipulation of the soft rubber, followed if necessary by the hard eraser, it is quite feasible to secure very even effects. Should the eraser not suffice to remove the ink completely from certain places, then an erasing knife or lancet will have to be employed.

Irregularities due to the inking-up or retouching are best corrected after defatting, by means of brush and water color. Pencil should not be employed because it is always glossy. Black or brown-black carbon pencils (crayon) are very serviceable.

Clouds can be successfully inserted in a lifeless sky by retouching, provided that at least a faint pigment film is present in the space.

The inking-up and retouching supplement each other. Consequently it is not practical to attempt adjustment of difficult places by the exclusive use of the pigment brush; it may sometimes be easier to correct irregularities on the defatted print.

Pigment to any desired thickness can be applied with the brush to finished, dry bromoil prints, preferably before, but even after defatting. This makes it possible to tone down empty areas which appear too glaring. In the same manner a halftone border can be provided on finished prints with white margins, by protecting the edges of the print and the outer edge of the intended border by suitably cut paper strips. Pigment is then carefully and uniformly applied with the brush between the protective strips, after testing the tint on a paper of the same kind.

Multi-color Bromoil Prints. — The bromoil process offers less difficulties to printing in two or more colors than any other photographic medium. Inks of appropriate shades are employed for the variegated sections. In simple bromoils, ink of the proper color is applied to the corresponding picture area and removed by means of a moistened stump or wet cloth where it infringes upon sections of a different color. The various tones are inked-up successively, and

finally blended by brush action. A separate brush is required for each color.

Pigments of vivid shades are best suited, because they can always be subdued and toned down by mixing with black and other colors. To harmonize and balance the effect, it may be advisable to pass finally over all of the print with ink of uniform tone.

Another way to secure colored prints is by multiple transfer. The several color sections are inked-up individually and transferred, before inking-up and similarly transferring the next color. An initial or final delicate pigmentation and transfer of the entire print serves to unify and balance the effects.

Still another method, though employing elements alien to the process, may render pretty results. A very light transfer is made and tinted by strong application of paste colors. A second black transfer is applied over the pastel. The result of skilled work will resemble colored etchings.

Colored prints are generally very difficult to make and likely to miss esthetic effect. The least possible number of colors should be employed, but those used should not be applied too hesitatingly, because the colored effect would be hardly perceptible. It is necessary to use large flat tones, since too much attention to details would prejudice the appearance and approximate the quite undesirable impression of colored photographs.

Only those workers should attempt multicolor bromoil printing who are versed in the handling of colors and able to judge their reciprocal effects.

PART II.

BROMOIL TRANSFER

Single Transfer. — The pigment lies upon the surface of the completed and undefatted bromoil print, without adhering especially firmly until hardened. It has been mentioned already that ink can be removed for the purpose of correction, by applying a paper to the spot and lifting it after vigorous rubbing-on with the finger. In this manner it is possible to remove ink completely from the halftones and in a large measure from the shadows. The same applies to the entire print. It is possible, therefore, to use the bromoil for printing by passing it through a press in contact with a suitable paper; by this operation ink is lifted completely or to a great extent from the emulsion and passes onto the transfer paper.

The transferred picture of course is reversed from right to left; consequently bromides which are to serve for transfer purposes should be *produced from reversed negatives*. Since enlargements are almost exclusively utilized, this reversal offers not the slightest difficulty. The negative is inserted in the enlarger so that the emulsion side faces the light source.

Transfer is the most beautiful and artistic of the photographic art processes. Its effect with skillful handling is incomparably beautiful, especially because

it permits the use of fine papers in great variety. The picture does not rest upon a separating layer, as in most of the light-sensitive papers, but directly upon and in the paper itself, just as in the finest graphic processes. After transfer the bromoil can be resoaked and reinked at once, and can furnish a number of transfers, which may be quite different in technique and color. Good, resistant bromide papers will allow from fifteen to twenty-five transfers before breaking down.

In single transfer it must be remembered that not all of the pigment passes from the bromoil to the transfer paper. Usually some ink (lost ink) is retained by the tanned shadows, where the adhesion of the pigment to the emulsion is greatest. Only prints without particular contrast can be counted upon to transfer all of the ink by a single transfer.

It must also be noted that the least trace of ink on the highlights, even if scarcely perceptible to the eye, passes completely to the transfer with very pronounced effect. In such cases the highlights will appear dull and muddy. *It is imperative to keep the highlights absolutely clear in bromoils which are to be transferred.* Mastic rubber applied to the highlights before transfer will indicate whether an apparently clear highlight bears traces of pigment film. It will make a distinct white mark, because it lifts the least trace of pigment from the gelatine.

The inking-up of a print for transfer is similar to the making of a simple bromoil, but it is advisable to employ a higher degree of swelling, which, while permitting the use of somewhat softened ink, still results in perfectly clear strong transfers. The softer ink clings to the shadows less tenaciously and will be

transferred more easily. The thinning of the ink must not be carried too far, of course, because it would lead to degraded, dull transfers.

The emulsion surface should be inspected with particular care. Impurities or undistributed pigment particles should be carefully removed, because it is as easy to lift them from the gelatine emulsion as it is difficult later to remove them from the transfer.

After completion of the bromoil, the question arises which transfer paper to select. Generally speaking, it is possible to transfer to any paper. But artistic considerations should guide the choice, since the selection of transfer paper will determine to a great extent the impression produced by the transfer. There is a wide choice of beautiful, high-grade papers of varied qualities, shades and structures. *Transfer is easiest on good copperplate papers*, which have only one drawback: that corrections are quite difficult on account of the fragility of the surface.

Because of the comparatively high pressure to which the bromoil and transfer paper are subjected while passing through the press, it may easily happen that the untanned and therefore sticky parts of the emulsion — as a rule the highlights, halftones and margins — adhere firmly to the transfer paper. *This evil can be completely avoided by spraying the transfer paper with spirit of turpentine (oil of turpentine).* It is carried out by placing the transfer paper upon a horizontal support and spraying it with spirit of turpentine by means of an atomizer. Allow the turpentine to evaporate for about five minutes and transfer unhesitatingly, because this simple preparatory treatment will positively prevent adhesion of the bromoil,

unless too little of the turpentine has been sprayed on. Too much turpentine, or immediate transfer after application and before the spirit of turpentine has had an opportunity to evaporate, will cause dull prints due to the surplus turpentine dissolving and floating the ink.

Transfer machines of varied shapes and construction are obtainable commercially. As a rule they are designed to pull the print between two rollers. The separation of these rollers may be regulated by a device, to obtain a selective higher or lesser pressure.

[Flat presses of the letter-copying type are not recommended, because of the fact that the pressure is necessarily distributed over the entire print area, and requires a tremendous physical effort. The bromoil almost invariably sticks and is ruined after the first transfer.

The usual etching presses regulate the compression by independent thumbscrews on each end or on one end of the rollers. It is sometimes quite difficult to secure absolute parallelism and to regulate the pressure, and the insertion and removal of the pack has its drawbacks. Moreover, the presses are very heavy.

Manual transfer by rubbing with the blunt point of an instrument or rolling with a cylindrical rod or needle below a cover plate is laborious, to say the least.

Dr. Mayer has devised, after exhaustive experiments, a particularly successful bromoil transfer press. The compression is instantly regulated by a central screw device acting upon a large leaf spring which in turn lowers the milled top roller upon the pack. A long crank handle actuates the lower roller and the transfer passes through the press

steadily and without jerking or slipping, and pressure can be delicately gauged and adjusted. — *Translator.*]

A transfer is made in the following manner: Place transfer paper upon a bristol board, adjust the bromoil thereon in proper position, and cover it with a sheet of good, absorbent copperplate paper which should be at least as large as the transfer paper. This cover paper has the purpose of absorbing water squeezed from the paper stock of the bromoil during compression. It is advisable to keep a few of these cover papers in readiness, and to change them after use; damp covers should not be employed because they wrinkle. As a substitute, blotting paper may be used, but wrinkles are more likely to occur. Such wrinkles show in the transfer and mar the print. On top of all, place a second bristol board of the same size as the bottom one. This "pack" should be passed once between the rollers under very light pressure, to produce a certain contact between bromoil and transfer paper. Then apply proper pressure by regulating the roller separation and pass the pack through the press again. This completes the transfer.

What working pressure to employ is a matter of experience. Each bromoil requires a particular pressure at which the maximum of pigment will transfer. A further increase of pressure is useless, and it is equally ineffectual to pass the pack repeatedly through the roller, increasing the pressure before each passage. The bromoil yields a certain amount of ink at a specific maximum pressure and neither repetition nor increased pressure would improve the result. Repeated pulling of the print through the press will only strain the bromoil unduly.

Open the pack very carefully after separating the rollers, because the bromoil strips easily from the turpented paper. Prevent shifting by placing a ruler across the back of the print, and lift one side to ascertain whether sufficient pigment has been transferred. If this is not the case, repeat the proceeding under increased pressure. It is advisable to place the long side of the print parallel to the rollers; it shortens the passage and reduces the effort.

The following remarks may be made on the technique of transfer: If the rollers are in contact, then all of the pressure exercised by the machine acts upon the tangent line on which the rollers meet. It is quite clear that the pressure action will increase as the field involved decreases, just as the same pressure diminishes in efficacy if the contact area broadens. Therefore, if, in disregard of the prior instructions, a thick "pack" is assembled, consisting of a number of intermediate layers of bristol board, blotting paper and even cloth (printer's blanket), this will considerably distribute the pressure applied by the machine, thereby reducing its efficacy very materially. The employment of such a bulky pack is otherwise of no advantage; it only causes the use of disproportionately great muscular effort for the achievement of the same printing effect.

[It is of very great help to once more resoak and cautiously surface-dry the completed bromoil, just before the transfer, and perhaps while the turpented transfer paper is drying. The properly swollen relief will yield the pigment readily and completely, whereas the dry emulsion clings to it tenaciously and renders the transfer much more difficult. — *Translator.*]

The transfer is complete on leaving the press, and requires, of course, no defatting; in this regard it is like a lithograph or etching. It has been mentioned already that the bromoil may be resoaked and used again for transfer. In case of frequent use the gelatine emulsion will finally loosen from the paper support, forming small blisters, particularly in the shadows, to which the ink clings the most. The cliché can still be continued in use until the blisters become so large that they fold up under pressure, whereupon the print becomes unusable.

The cliché can be stored for use at any later time, but in this case all ink should be previously washed off with benzine (or Carbona or carbon tetrachloride).

Multiple Transfer from a Single Bromoil. — It has been mentioned before that in single transfer the ink does not as a rule pass over completely, unless the print had no particular contrasts and consequently only slight tanning differentiation. A considerable remnant of pigment adheres firmly to the shadows of contrasty bromoils. In such cases the effect of the print on transfer paper differs from the appearance of the bromoil, because the gradation of the print is determined by the totality of the ink which rests upon the latter.

A simple remedy is "airing," which is based upon the following observations: The bromoil yields in the press a certain maximum of ink. Further increase of pressure does not produce the transfer of more pigment. But the bromoil will release additional ink, after air has been admitted to the emulsion, by lifting it from the transfer paper while holding one edge immovable in place, then replacing it carefully in its

original position and passing it through the press under the same pressure as before. By repeated application of this manipulation it is frequently possible to transfer all of the ink. This offers the great advantage of reproducing the same effect which appeared in the bromoil. This operation suffices where the impression produced by the bromoil was in itself already satisfactory. *It will be necessary to employ multiple transfer to produce altered gradation,* as for instance to intensify certain places, etc. This offers no difficulties at all, particularly when using a single bromoil only. Multiple transfer is as frequently employed in practical work as single printing.

Multiple transfer with one bromoil takes place as follows: A normal transfer is produced, avoiding the use of too much ink. It is easier to build up successfully on a light print. The print is removed from the press carefully to avoid shifting. With a ruler and well-sharpened pencil, lines are drawn on each edge, in such a manner that each pencil mark extends partly over the back of the print and partly on to the transfer paper. The marks on the transfer should be quite short. The point of the pencil should be held perpendicular so as to avoid the break which might result from jumping from the bromoil to the transfer paper surface, and which would render subsequent registering more difficult. After providing these register marks, the print may be removed, resoaked, and re-inked. Now pigment should be applied only where it is lacking in the transfer to complete the effect. It may be necessary to repeat the transfer a number of times in this manner to secure the desired impression. Sight should never be lost of the fact

that the visual value of a pigment layer on the transfer is much stronger than on the bromoil. Therefore, guard against exaggeration. As everywhere, here experience is the best teacher.

Another method of producing a multiple transfer with a single bromoil requires considerable swelling of the emulsion. The shadows and dark halftones are inked up with hard, stiff pigment. Ink of this consistency will take only in such places because highlights and light halftones repel it. This we shall call the "shadow print." After transferring this vigorous print, employing if necessary the "airing" process, and after providing register marks, it is resoaked and inked again, but this time very lightly and with soft ink. The thinning of the ink should be carried only to a degree where the highest lights remain absolutely clear. The pigmentation of this second print, the "highlight print," should be very delicate. If this second print is registered and transferred, the delicate halftones take their place alongside the shadows and darker halftones which were transferred previously, and at the same time intensify the latter, while the highlights remain clear. The gradation of this transfer may turn out to be much richer and more beautiful than that of the bromoil, because the depth of inking of the shadows of a bromoil is naturally limited, if details are to be preserved. This method of combination transfer produces very fully modulated prints, and is particularly suited for portraiture.

Of course, either the shadow print, which is produced with hard ink, or the highlight print, which is inked up with soft ink, may be retransferred repeatedly.

Combination Transfer from Two Bromoils. — The previously described method of multiple transfer from one bromoil, using ink of two different consistencies, involves a certain dependence upon the gradation range of the basic bromide print. This gradation can only be lengthened, for missing details cannot be supplied. *To secure more gradation than is obtainable from a given negative by bromide printing, it will be necessary to make combination transfers from two separate bromoils.*

The following experiment may illustrate the theoretically achievable increase of gradation. Two bromide prints are made on thin paper from one identical negative. The first print, with barely normal exposure, is strongly developed. The other, with about four times the correct exposure, should be developed in very diluted developer until the image becomes lightly, but completely visible. The finished prints are superimposed before a strong light and brought to perfect register. The transparency is now the result of combining the two prints; it reveals a surprisingly rich gradation, such as the negative would yield only on the very best printing-out papers.

To achieve similar results by transfer, necessitates *two component prints of the types just described*, which are produced by the method indicated in the preceding experiment. In order to register exactly transfers from the two separate bromoils, a shadow and a highlight print, the following requirements have to be fulfilled: 1 — The prints must be placed alike in the picture space, and 2 — Marks have to be provided, which make the registering of the transfer possible. The first condition is easily fulfilled by masking the

negative with straight, sharp-edged, black paper strips. With identical enlarging conditions both prints will be placed alike in the picture space. This framing may be more securely and simply provided by scratching the four border lines into the negative emulsion by means of a sharp-pointed needle and a ruler. These clear lines will remain sufficiently sharp even at considerable enlargement. The finished prints are then carefully trimmed along these border lines; they fit very precisely over each other and the image is placed identically.

To provide register marks requires the existence of well defined points in different places of the image, such as wall corners, tree forks, or pinholes, which should be located approximately in the center of, and close to, the edges. In the absence of such guide marks, exceedingly small carmine dots are made with a fine retouching brush in suitable clear places of the negative emulsion, or tiny pinholes with a needle point in dense portions. These marks will print on the two component prints as white or black dots. After drying and flattening of the prints, these dots are pricked with a needle and the prick marks connected on the print backs by fine pencil lines which are continued on all sides to the edges. Any three triangularly located marks provide six such register marks, of which however, only three are required. The pencil lines should pass precisely over the summit of the prick marks produced by the needle on the print backs. After the lines are drawn, these small protuberances must be leveled with a paper folder or the finger nail, to close the pinhole so as to prevent entrance of water from the back between the paper and the gelatine.

The prints are bleached and used for the combination transfer. It is best to start with the transfer of the vigorous bromoil, which should not be too heavy in the shadows and wherein the gradation extends only to the medium halftones, as a result of adequately high swelling. Then follows the imprint of the highlight print. If the result does not satisfy, one or the other of the two cliches may be re-inked and again superimposed.

Should it appear desirable to accentuate a transfer after several later combination transfers have been pulled, it will generally be found impossible to do so, because the prints stretch quite considerably by frequent passage through the press, and therefore do not register on earlier prints.

On account of this stretching of the paper stock it is necessary to make both bromide prints on paper from the same package and to send both bromoils through the transfer press in the same direction, preferably across the length. With this precaution, the inevitable stretching will be uniform and the cliches register sufficiently.

Regarding the limitations of bromoil printing and bromoil transfer respectively, the following may be said: bromoil printing, which was originally conceived and perfected as an independent process, has been eclipsed by the transfer process and functions at present as a preliminary step to the transfer. Of course, bromoil should be completely mastered before taking up transfer. Whosoever dominates transfer completely, including its more complicated forms, will achieve with it a great deal more than with simple bromoil printing. Notwithstanding any inherent

superiority of the transfer process, a good bromoil is better than a mediocre transfer, and there will always be cases, particularly in portraiture, where bromoil achieves the intended result in a simpler and easier manner than transfer. The medium which attains the intended aim in the best and surest manner is the one which should be employed.

[Dr. Mayer has expressed himself about the use of rollers for the purpose of inking bromoils. Since workers hear about this utensil and find it recommended as a facile method to ink up quickly, it appears desirable to state Dr. Mayer's views:

Rollers were introduced several years ago, and disappeared. Recently they have been retried, only to be soon again discarded, because a number of bromoil workers had ill success.

All rollers, whether of glue, velvet or rubber, require the highest possible relief and very thin ink. Even a thinning of the ink with benzine may eventually be necessary, which is uncertain, as the benzine evaporates again during inking. The result is a smooth, hard picture, which may have to be modified by subsequent brush work. The entire procedure is dangerous and foreign to the essence of bromoil printing. Individuality of the print is completely destroyed and the work becomes mechanical, which is just the thing which should be avoided in bromoil printing.

As early as 1912, in the first edition of his book, Dr. Mayer energetically opposed this inartistic method of inking, which has all the disadvantages and only one relative advantage, namely, that the inking is quicker under certain conditions. The result is

generally bad and the prints are always endangered and overstrained, because they frequently roll up on the roller and are ruined. Recently Dr. Mayer again tested all the rollers in the market and condemned them. Not even speed now remains as an advantage, because inking with a large brush is just as quick as with a roller. Therefore it is recommended to avoid the use of rollers. —*Translator.*]

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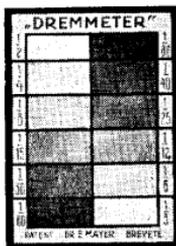
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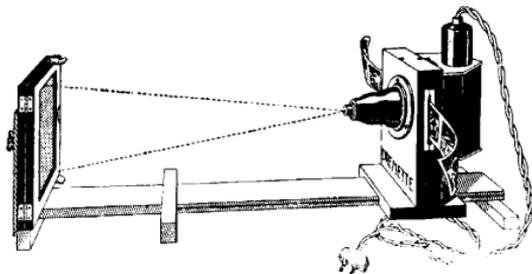
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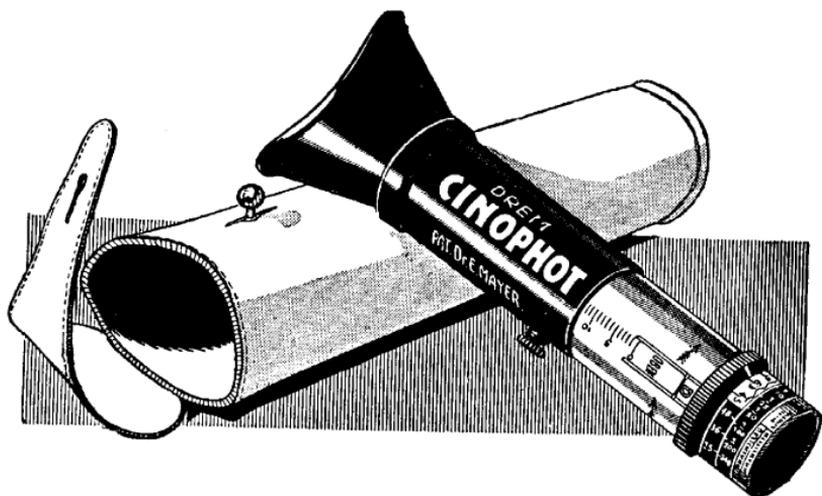


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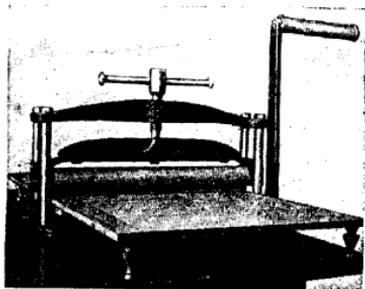


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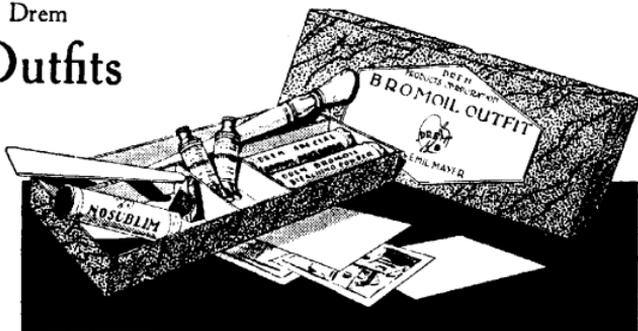
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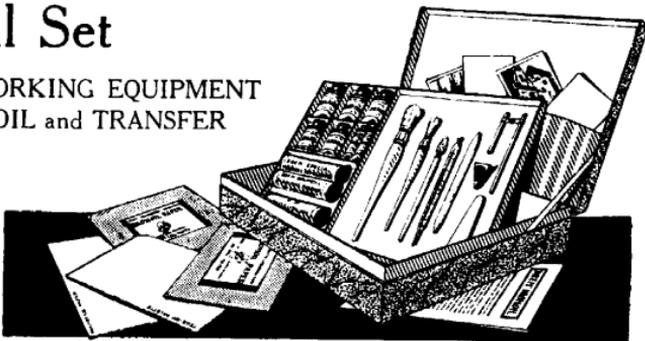
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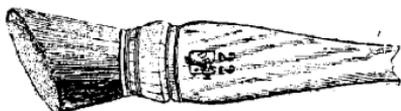
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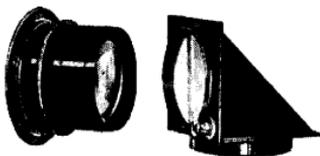
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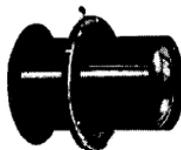
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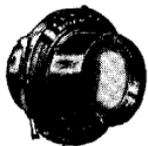
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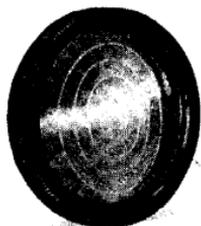
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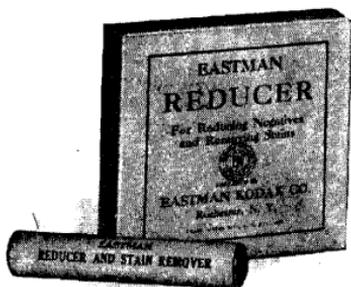
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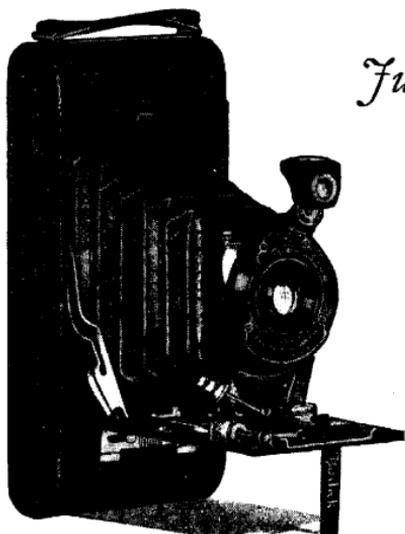
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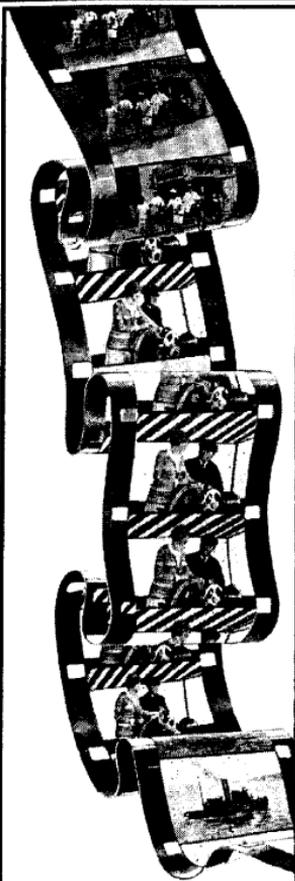
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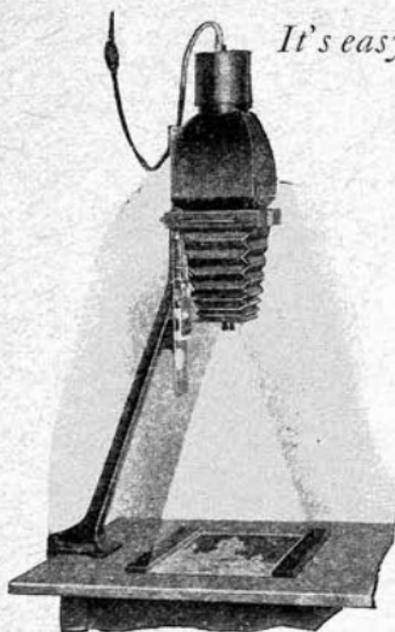
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