CHAPTER VII

BROMOIL TRANSFER

By Eugen Guttmann

THE idea of transferring a bromoil print to an ordinary, uncoated paper was first introduced by the English and later further worked out by the French. The Germans turned to this new process comparatively late, but obtained fine results. Yet the practice of this beautiful form of artistic photography was limited to a small circle of adherents, and even today, when bromoil printing, thanks to the instruction of some excellent textbooks, has become known to almost all artistic workers, one cannot state that it enjoys wide popularity. This may well come from the fact that not everyone has the absolutely necessary printing machine, and that the substitutes for this machine, such as burnishers and washing mangles, cannot bring out all that lies in the process. In addition, when the process was first introduced, the transfers were never strong enough, and were mostly muddy and flat. This happened because, in the first years of the process, strong and vigorous shadows were not produced on the paper. The English and French improved this by pigmenting the shadows of the bromoil print much more strongly than was needed for this process. They stated that the chromated film took the ink very readily in the shadows, but parted with it again very unwillingly. Thence they concluded that, in order to be able to transfer much ink to the

paper, a surplus of ink must be imparted to the shadows; they thus corrected the tone values by deepening the shadows, and contended that they produced their beautiful transfers in this way. I have never seen an English transfer, but plenty of the French, which were said to have been prepared in this way. From my own experiments extending over a long period, I doubt whether the depth in the shadows could be attained in this way, and can only assume that very important particulars have not been made known in the excellent publications on this process. A simple reasoning, without any trial, also leads to the same conclusion. If, for instance, I overink the shadows by imparting to them more ink than the tone values require, then I smother all the details in them and in the transfer I shall obtain a black, absolutely detailless patch. The English and French contend, however, that all details, which are made invisible by overinking the bromoil print, become visible again in the transfer. They thus explain the matter approximately as if we were dealing with a carbon print, in which the whole film is "reversed" during the development. This is absurd. A *moderate* overinking will obviously give better shadows, but this limitation is of no advantage.

For an important advance in the direction of the production of vigorous shadows in the transfer we are indebted to the work of Hanns Benndorf, which was described in an article, "The Technique of the Bromoil Transfer Process" (*Phot. Rundschau,* 1914, Heft 9, 10). He used the method of printing in superposition common to all gum printers, since he first pigmented the original print in a normal manner but with weaker shadows, printed it and then inked up a second time, treating this

time merely the shadow parts which were to be strengthened, and then printed it on the first transfer. The results were actually very good. But the process still required considerable dexterity; its chief difficulties appear to me to lie in the fact that in the second pigmenting it is uncommonly difficult to so bring out the shadows that they do not appear too deep in the final print, and the middle tones and high lights are thus out of tone. The process is very suitable for bringing out individual parts of the shadows.

On the other hand a considerable advance in the development of the process was made by Dr. Emil Mayer, and this consisted of giving to the bromide print by exposure and development a particular character only suitable for this purpose. Fuller details of this are given under the heading "Combination Transfer with one Print Plate," page 125.

In most publications on bromoil transfer, directions are finally given to pass the finished bromoil print quickly *once* through the machine with a *heavy* pressure of the rolls, and at the most *twice*. This advice has received my special attention, because I found that in this way good as well as bad transfers could be obtained; but I decidedly could not count on *always* obtaining equally good results. I noticed that things went well when I had a pressure on the rolls which was suitable for the bromoil print and the structure of the paper. Getting this correct pressure was pure luck. If the pressure was too great, then I indeed got all the ink on the paper, but the shadows were wanting in detail and flat; if on the other hand it was too weak, the shadows remained much too grey.

Hence I came to the idea of so adjusting the rolls

that I printed at first with only a light pressure. I then had as a result a transfer which was absolutely white in the highest lights, yet showed all the gradations of the bromoil print in the high lights as well as in the finest and fine half-tones. The shadows, on the other hand, were grey and not filled up, for much of their ink still remained on the bromoil print. Then I again inked the same bromoil print and printed again as before, but did not take the paper from the machine, observing the transfer by carefully lifting the bromoil print. It was exactly as described above. Now I allowed the paper (the lower part of which was still held by the rollers, further details of which will be found in the section "Printing") to again come into contact with the bromoil print, screwed down the central spindle to increase the pressure, and passed the pack again through the machine. The result was highly satisfactory. The highest and the high lights, as well as the half-tones, remained as they appeared at the first pull, but the shadows were fully filled up and completely transferred from the bromoil print to the paper.

Thus I had discovered *the principle of printing with increasing pressure of the rolls.* Further experiments led me to improve the method, and the following instructions give all necessary explanations and directions.

I must remark that from the start I used a machine the arrangement of which permitted me to see the print during the printing, and with which the pressure on the rollers could be regulated at will.

The transfer is not only a step toward the greater development of the bromoil print, it is so beautiful in its results that no other photographic process, with the exception of gum printing, at all approaches it. By the

transfer process, photography has made its first entry into the ranks of the graphic arts. No positive process, other than bromoil transfer and gum printing, has overcome the oft-bewailed shortcoming of photography, that there is no sun in the picture, as well as these two processes. *It is even possible in them to use as the highest light the pure white of the paper.* In this respect transfer still has the advantage of offering a more rapid if not an easier technique.

Certainly the ordinary bromoil print also gives excellent results. Its whites are, however, formed by the photographic film, and this is its only disadvantage. There is, however, always a difference of beauty between a bromoil print and its transfer, the appreciation of which is purely subjective. We can accept it as certain that feeling in a picture printed in bromoil is attainable by simpler means than in the more difficult transfer. The photographic artist will decide for the one or the other according to the results desired.

THE BROMOIL PRINT. — *For every transfer there must be a bromoil print, complete in every part.* That is an indispensable requirement for those who desire to practise transfer.

That a perfect bromoil print can only be prepared from a perfect bromide print is generally known. It is not my province to describe both processes fully, for that was long since done by various writers in excellent works. But it is my duty to give some hints as to the way in which the bromoil print should be prepared in order to obtain the best possible results by my new printing technique, which will later be fully described.

The transfer printer must always keep in view the fact that he must prepare the way for his final *artistic*

results in all previous phases of the technical preparation of his print. He will, for this reason, in a careful and well planned working up of the negative, bring out the characteristics and feeling of his ideal result by toning down or suppression of such parts of the picture as may be necessary, a task which has nothing in common with the process generally called retouching. He will also make the bromide print, whether by contact or enlarging, with greater deliberation and care than is used in most cases. Too much reliance in this respect is often placed on the omnipotent technique of bromoil, which allows us to carry out the most far-reaching alterations on the print. This can certainly be done; but perhaps this way is even more difficult than taking every necessary precaution right from the start and producing it correctly — in one word: creating it.

Far too little use, for example, is made in enlarging of bolting cloth, chiffon, or some such open-meshed fabric which, according to requirements, may be used with wide or narrow mesh, or even doubled, two pieces in contact [preferably with the threads at an angle of 45°. — Trans.]. Used with discretion, this gives valuable assistance in producing an artistic softening of contours and contrasts. The same purpose is attained in perhaps even greater perfection, by using the procedure recommended by L. Vernouille of Vienna. In this method of enlarging *two sheets of tissue paper,* of the size of the enlargement, are laid upon the film side of the bromide paper, and the exposure is made through these two sheets. It is important that the time of exposure be exactly determined; this is about double that of the usual enlargement. The tissue paper must be perfectly white and free from imperfections, black specks and folds, etc.

Besides these tricks a slight want of sharpness may be used to give the desired effect, or also the interposition of ruled screens between the film and the negative.

If it is desired that the bromoil transfer shall show a canvas effect similar to that of oil paintings, the simplest procedure is as follows. A piece of cloth is cut from a material which has the necessary structure, *slightly* larger than the size of the print, and laid flat on a stiff support such as pressboard. Then a new piece of carbon paper, such as is used in typewriting, as thin and free from faults as possible, is cut to the same size, immersed in water, allowed to drain, and placed smoothly on the material; a second sheet of pressboard is then placed on top and the whole subjected to a strong pressure, say between the rollers of a burnishing machine or washing mangle; if one has not these, then in a copying press. The carbon paper shows when dry the perfect structure of the material. If this structure paper is now placed between the paper and the negative, or in enlarging in contact with the paper, the bromide print shows this structure together with a very plastic rounded image, and a longer exposure is not necessary. I consider this procedure better than the use of the commercial structure screens, since one is free in the choice of the material from fine lawn to the coarsest canvas, while among the commercial articles there is seldom one which is quite satisfactory, and of course no such variety.

The final size of the picture must be drawn on the bromide print in pencil before the bleaching, for the positions of the edges cannot be determined on the bleached-out print, especially when the bleaching is complete. After the bleaching and drying are finished,

the pencil marks should be cut through with a sharp knife on a glass plate, and the print is thus given the desired size. From this point on, one should be most careful not to touch the print with the fingers, except on the back, which can be easily done with a little care, by always lifting up the edge with a knife.

It is immaterial what bromide paper is used. It may have any surface, be thick or thin, though thick paper is to be preferred. For prints and transfers which should show the greatest possible fineness and modeling, it is better to choose a smooth bromide paper.

The prepared print is swollen and pigmented as in making an ordinary bromoil print. *It is not necessary, when planning to make a transfer, to produce a higher relief by a warm water or ammonia bath,* which requires the use of softer inks and limits artistic freedom in working up. One's whole attention must be focused on a *single point:* the shadows must be *clean,* the lights *pure white.* If this condition be neglected a good transfer cannot be expected. Deviations from this fundamental requirement are only permissible for those who have absolutely mastered the printing technique, and who, therefore, can foresee the results with certainty.

One must take into account the fact that the transfer process has a very marked tendency to lower the tones. The high lights and fine half-tones always appear somewhat darker in the transfer than in the bromoil print, while the shadows, with *correct printing,* remain the same. It is, therefore, absolutely necessary to lighten up the high lights and the fine half-tones just as much as they lose in brilliancy in the transfer. Obviously no description is of any value on this point; a few experiments made for this purpose will quickly put one on the right track.

The fact that the bromoil print is *trimmed* before being placed on the pad has caused some nervous souls to be afraid that water may thus come from the support through the brush on to the film, but this is not likely to occur. The pad should be arranged by first laying on the glass plate a thoroughly wet copying sheet; on top of this a second sheet is laid, equally wet and with no air-bubbles between. The water is completely dried off the surface of the second sheet with the aid of a sheet of lintless blotting paper, and then one can work all day long even in summer in the greatest heat without changing the support; there will always be enough moisture to produce adhesion between the sheet and the support, but one will never carry a drop of water on to the print with the brush.

THE CHOICE OF THE PAPER. — The pigmented gelatine film gives up its ink when it is brought into contact with paper under pressure; from which it seems that theoretically paper of any quality may be used for the transfer. In practice the matter is not quite so simple, for every paper surface possesses an individual character which definitely influences the ink transfer and the final result.

Papers may be roughly classified as rough, medium and smooth, obviously with many intermediate grades, each of which may be divided into sized, half-sized and unsized sorts. Whether a rough, medium or smooth structure is to be chosen, must be decided from a purely artistic point of view, and in this decision the character of the subject and the effect desired are of equal importance. It is different, however, as regards *sizing*. The quality of the picture frequently depends on a correct decision on this point. This is at once clear when

we consider that unsized paper is much more porous than half-sized or fully-sized paper, and thus can remove the ink much faster and more completely from the bromoil print. If, for example, a bromoil is transferred with a certain roll pressure on copper-plate paper, that is, on a very absorbent porous paper, the ink will be quickly transferred to it, whereas a sized paper, under the same conditions, that is, with the same pressure on the rolls, will take up only a small part of the ink. A comparison of the two transfers would then show that the shadows on the copper-plate paper are blocked up and have lost many details, while those on the sized paper appear much too light, which is readily understood, as the porous paper has taken up all the ink, the sized paper merely a portion of it.

How far these properties of papers can be equalized or used will be dealt with in the section on " Printing."

In choosing the paper destined for the transfer, therefore, attention not only has to be paid to the structure, which must serve the artistic purpose, but one must be certain of the amount of sizing; this latter is necessary so that one may correctly carry out the actual printing process.

As a basic principle the worker should use only *pure rag paper* and avoid all paper containg *wood pulp.* Although theoretically it cannot be disputed that any paper is suitable for transfer, it is also practically accepted and undoubtedly correct that *beautiful prints* can only be prepared on *good papers,* and the artistic photographer should not be induced by any consideration to use other than the best materials.

All the commercial drawing and water-color papers of all tints and structure, made by reliable firms, can be

recommended. Extraordinarily fine results are obtained on copper-plate printing paper, which may be obtained in white and yellowish tints. Equally as good, and specially suitable for certain effects, are the Japanese and Chinese papers.

The stock of paper should be kept in a dry place and free from dust.

Printing should only be effected on *dry* paper. Damp paper is used when it is *very coarse-grained* and rough, as then the ink is more easily taken in the depressions. Such sheets are best dampened by immersing them for some minutes in water, allowing to drain and passing them through the machine between two sheets of calendered lintless blotting paper with strong pressure; they are then immediately ready for printing.

If one has to deal with very absorbent papers, with which, especially in the pure whites, there is always danger that in spite of careful printing the gelatine film may adhere to the surface of the paper and thus spoil both bromoil print and transfer paper, the paper should be given a slight sizing. The preparations to be used for this should be those used by the gum printer: gelatine hardened with alum, chrome alum or formaldehyde. But these solutions must be applied warm and then the original brightness of the paper suffers. It is, therefore, more advantageous to use the *cold* preliminary coating recommended by von Hübl to prevent the sinking-in of the platinum-iron solution for platinotype; 2 g (60 gr.) of rice or wheat starch or arrowroot should be rubbed up with a little water and added with constant stirring to 100 ccm (3 oz.) of boiling water. When quite cold the solution should be applied evenly to the paper with a swab. The application must result in a

slight matt gloss on the paper without any damp places anywhere. When dry it is ready for use. The longer the paper is kept after this preliminary preparation, the better it is.

The beginner will be well advised always to use one and the same quality of paper until he has succeeded in attaining full command of the printing technique; I have already pointed out that papers of different surfaces take the ink from the bromoils with different degrees of ease or difficulty. Similar differences also occur with increase of pressure. When the operator has once become perfectly familiar with the necessary adjustments of pressure with *one sort* of paper, he will be able without difficulty to estimate the degree of pressure for other papers. At the start it is advisable to use a good, half-sized moderately rough drawing or water-color paper.

It may be remarked that transfers may be made on silk or other textile fabrics as well as on paper. If permanent results are desired, care must be taken that pure fabrics are chosen, that is, such as are not filled, as is usually the case with silk. As the fillers are usually metallic salts, they may easily have a destructive chemical effect on the inks.

THE MACHINE. — In order to obtain a good transfer, a machine is required which must satisfy to the fullest extent two requirements: the pressure on the rolls must be capable of being regulated at will before and during the printing, and one must be in a position to examine the condition of the print at any time, without danger that the bromoil print and the transfer paper will shift. By pressure on the rolls is meant the distance between the two cylinder surfaces.

The autographic metal hand press, model A, as supplied by the firm of Hugo Carmine, Vienna VII, at comparatively reasonable prices with different lengths

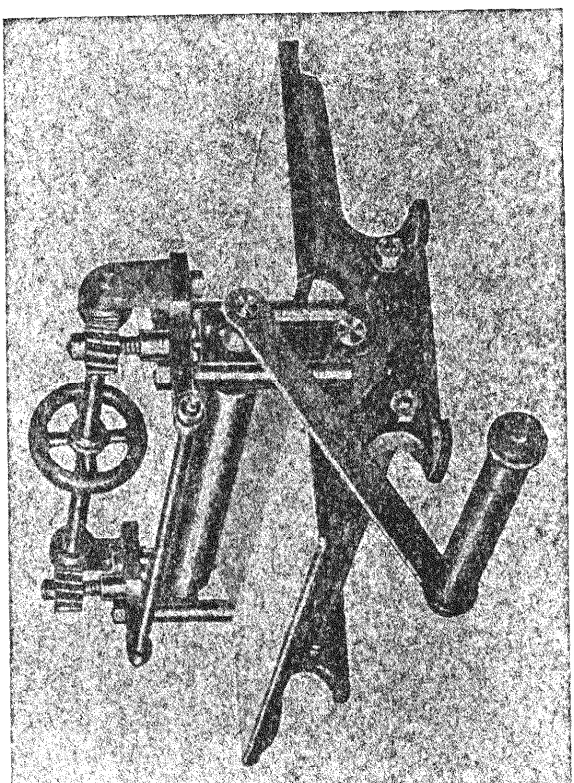

FIG. 1

of rolls, is almost an ideal machine for our purpose. It is shown in Fig. 1 and consists, as will be seen, of a massive metal stand, which may easily be screwed to any table. Through the center goes the lower roll or print-

ing cylinder, which is prepared of an elastic material, and this stands at the same height as the two tables seen on both sides. Above this lower, immovable roll, there is the upper one, which can be set higher or lower as required by the central spindle, in the center of which is the wheel. The central spindle is so arranged that the upper roll can be raised or lowered by screw gears at the right and left, the arrangement being such that absolutely even pressure is exerted at the two ends. On the right screw gear there is a notch in the form of an I, which with every half revolution of the central spindle moves the length of one tooth forwards or backwards, according to the direction chosen, so that it is always possible to produce an absolutely determinable pressure. The rolls, after the setting of the pressure, are rotated by the handle visible on the right.

This is the whole machine. Its dimensions are determined by the length of the rolls, and these are chosen as may be needed. One with 40 cm (16 in.) rolls ought to be sufficient for most work.

It may be possible to rig up existing burnishers or washing mangles. Whether good results can be obtained therewith, I cannot say from my own experience.

The care of the machine is very simple; it needs only to be oiled from time to time.

Although this, or any other suitable machine, is so simple in construction, and its manipulation is so easy, yet one ought not to forget that he who uses it ought *not* to be a machine. The printer must be very familiar with his press, if it is to give its best. Whoever does not believe this should ask an etcher, who will soon tell him how much a good printer can add to a copper-plate print.

PRINTING. — In order to obtain from any bromoil

print one or more pulls on uncoated paper, one requires, besides a printing machine, also — experience.

Before I proceed with the technical description of the whole process it will be as well that we become perfectly clear as to the conditions under which transfer takes place.

Bromoil printing has been described as a direct derivative of the collotype process, and it is. This very close relationship, however, is merely because of the common property of the exposed and swollen chromated gelatine film, but does not extend to the method of execution, in which bromoil printing displays an independent technique. The primary difference lies in the support: collotype uses a glass plate as the support for the chromated image, bromoil printing uses paper. This causes a variation in the subsequent procedure, especially when the bromoil print is not the final result, but merely the means for making the transfer. The application of the ink to the swollen gelatine also is quite different in collotype and bromoil printing, and the transfer of the ink to the paper by means of a machine is done differently, all of which are based on the differences of the support.

The bromide print, which is taken as the starting point in bromoil printing, should be made on a paper as dense in structure as possible; thick paper, therefore, is advisable, because the film remains damp longer during the work of pigmenting, and also because all subsequent manipulations are carried out more easily with thick than with thin papers. In the collotype process, on the other hand, the chromated film is carried on glass. When it comes to printing, it is clear, from what has been said, that the bromoil print not only contains the moisture which is absolutely necessary in making it, but also

that which is in the fibers of the paper. The whole of this dampness is pressed out of the paper fibers and the film, during the printing, and combines with the ink to a kind of emulsion. This *emulsion-like mass* is brought on to the paper by the machine, *not the ink alone,* as in collotype, the chromated film of which holds only that moisture which is requisite for its swelling, while its support, the glass, can retain no moisture. It is also the fact that the amount of moisture in the collotype film is so small that the formation of this emulsion practically does not occur. From these comparisons and explanations it also follows that the printing technique of the two processes must differ.

I have dealt with these facts with more completeness because it is commonly assumed that the printing of a bromoil print must be carried out like that of a collotype print, and most of the failures result from ignorance of the differences discussed.

So, while the collotype matrix only gives up its *ink,* the bromoil matrix gives up a mixture of *ink and water* to the paper. This emulsion is so constituted that it readily adheres to the paper where it is in the finest state of division, but where it is thicker it is more difficult to made it adhere. In other words: the high lights and the most delicate and medium half-tones readily transfer to the paper under light pressure, while darker half-tones and the shadows must receive a stronger pressure, from which it again follows, that in order to obtain from a bromoil print a transfer equally good in all its tones, *I must print with gradually increasing pressure.*

That is the reason that induced me to use a machine, with roll pressure which can be varied at will, as I have described more fully in the chapter on "The Machine."

The procedure in printing must now be very accurately described, and takes place as follows:

The pressure which the rolls exert on the bromoil print and the paper as they pass through must be absolutely even, at every point. In order to make the pressure more uniform than the rolls of even a good machine can give alone, it is necessary to imbed the print and the paper in a press-pack. This press-pack generally consists of two pressboards (hard, thick, glazed pasteboard), at the bottom, an ordinary pasteboard, a copper-plate blanket, that is a thick felt, and another ordinary pasteboard. On this pasteboard the bromoil print is laid, and on this the printing paper. On this printing paper there are now placed in order another copper-plate blanket, an ordinary pasteboard and finally two pressboards. Before, however, we pass a press-pack, thus prepared, through the rolls, it must be explained in fuller detail, which is best done from an actual example.

Let us assume that we have a print prepared as described in the chapter "Bromoil Printing," ready for transfer. Its size shall be 16 × 21 cm ($6\frac{1}{4} \times 8\frac{1}{4}$ in.). Our intention is to print this on paper of the dimensions of 30 × 40 cm ($12\frac{1}{2} \times 16\frac{1}{2}$ in.), and to surround it with a plate mark. As the size of the paper is 30 × 40 cm ($12\frac{1}{2} \times 16\frac{1}{2}$ in.), the four pressboards, the three ordinary pasteboards and the two copper-plate blankets should be cut exactly 32 × 42 cm.

The two pressboards are accurately superposed on a table and then the pasteboard and the blanket are placed on top. On the last, as already stated, another pasteboard is placed, which must, however, be previously marked with pencil guide lines, for on it are to be laid the bromoil, the paper and the plate-mark pattern. As

we wish to surround the print, which is 16 × 21 cm, with a plate-sunk mark, we must cut a sufficiently large pressboard to impress this mark. Let us say we wish to surround our vertical print with a margin which shall be 1 cm ($\frac{3}{8}$ in.) wide above and right and left, but 2 cm ($\frac{3}{4}$ in.) below, then we must cut the pressboard 18 × 24 cm ($7\frac{1}{2} \times 9\frac{1}{2}$ in.). When we have done this we mark on it with a pencil exactly the position of the 16 × 21 cm bromoil print. Now we find on the 32 × 42 cm pasteboard the position at which we wish to have the 18 × 24 cm pressboard just cut (as a rule this will be a little above the center), and fasten it there very lightly with library paste or mucilage. The 18 × 24 cm pressboard now lies on the 32 × 42 cm pasteboard. As the size of the paper is only 30 × 40 cm, this will leave a margin of 1 cm on all sides, and this future position of the paper should be accurately marked with the pencil on the pasteboard. Extreme care having been taken that all the lines are parallel and the measurements correct, we can now place in the press-pack the bromide print and the transfer paper, and proceed to print.

The marking of the individual layers may be done very simply and accurately if it is carried out as shown in the accompanying diagram. This marking of the layers has also the advantage that we may use it for all sizes with slight alterations for individual cases. The lay-out is very easy. The pasteboard which carries the plate-mark pattern is cut accurately right-angled and must be about 2 cm ($\frac{3}{4}$ in.) larger all around than the transfer paper that is to be used. On this board we now draw, exactly 2 cm below the upper edge, a sharp line with ink that will not smear, such as waterproof drawing ink, stopping exactly also 2 cm from each edge. Then

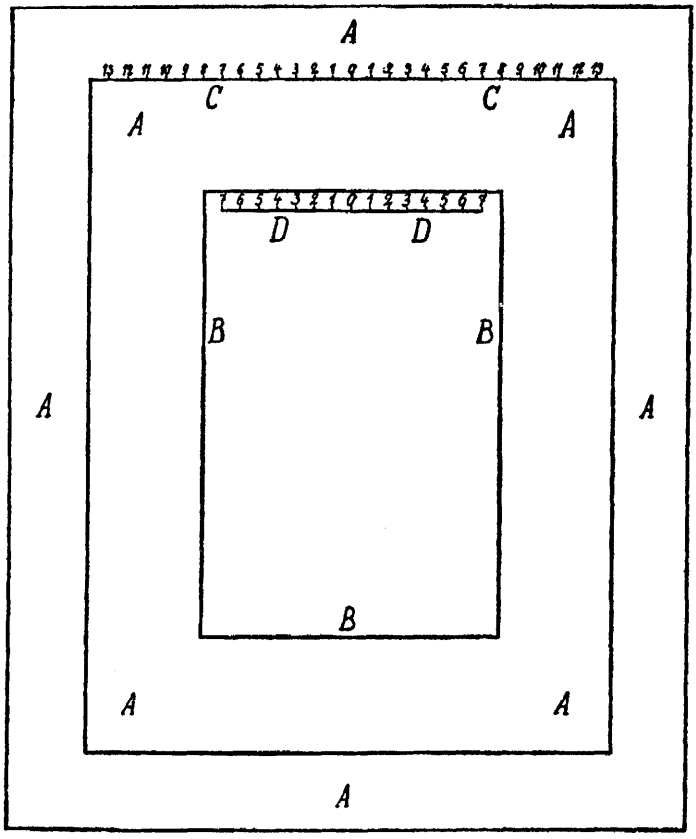

FIG. 2

A = pasteboard
B = the plate-mark pattern
C = the location guides for the transfer paper
D = the location guides for the bromoil print.

this line is bisected and the center point marked zero; right and left of this zero point we now draw equally distant upright lines, about $\frac{1}{2}$ cm ($\frac{3}{16}$ in.) apart, which are numbered 1, 2, 3, . . . to the ends of the line. Like divisions are drawn on the plate-mark pattern, or if this is not to be used, at the place it should occupy. The bromoil and the transfer paper are now laid down with the help of these lines so that the upper corners are equidistant from the zero point, which can be very easily done. These location guides are also very convenient in combination printing.

We now have lying in front of us one on top of each other: two pressboards, an ordinary pasteboard, the copper-plate blanket and the pasteboard with the plate-mark pattern and the marks for locating the paper.

Now the bromoil print is lifted from its pad by passing a knife under its edges, and laid carefully with its *back* on the worker's left hand. Thus the print can be laid down face up *without danger of damage* on the plate-mark pattern, adjusting it by the position guide before sliding out the hand, all without touching the face of the print. Great care must be taken that the print lies absolutely flat. It will adhere to the pasteboard without any aid except its own moisture. Now we take the printing paper, hold it at the upper third of its surface with the two hands and bring the upper edge to coincide with the pencil lines on the pasteboard which carries the plate-mark pattern, taking care that it does not touch this pasteboard. When the edge of the paper and the pencil lines coincide, the paper is carefully allowed to drop into position from the top to the bottom. It now lies on the bromoil print; now, holding it *very gently* on the bromoil print with one hand, the

previously prepared copper-plate blanket is spread out with the other hand over the paper and pasteboard, and the two pressboards are placed on the cloth in the same way. Care should be taken that the whole arrangement is fairly evenly made up, so that none of the edges of the boards or blankets project beyond others. If this precaution be omitted it may happen that the transfer paper is squeezed into wrinkles running from the edges to the middle, which may even encroach on the print itself. These squeezed-in wrinkles, which, if the pressure be great, may appear like sharp cracks, make the print useless. This whole manipulation is rather difficult to perform at first, but it is learnt very rapidly, especially if the first experiments are made with a damp sheet of paper the size of the bromoil print instead of the print itself, and one thus becomes expert.

When the press-pack has been made up in the above-described manner, it should be taken firmly in both hands, so that nothing can shift, and the upper edge placed on the machine table and guided between the rollers, the separation of which must be such that they just grip the pack *without exerting any pressure*. This separation must be determined by experiment. The pack should then be gently drawn through until about 4 cm (1½ in.) of its lower edge remains protruding. Shifting is then no longer possible. The rolls should now be tightened, for which purpose the central spindle should be given six to eight *half* revolutions. The exact pressure cannot be prescribed, but it will always be better to begin with light pressure. The handle is again turned and the pack drawn through the press, until its upper edge sticks out about 4 cm (1½ in.). This process is repeated four times — twice in each

direction. If, after the fourth revolution, we carefully lift up the upper layers including the paper — obviously while the lower edge is still held fast for about 4 cm by the rolls — we can inspect the *first impression* and will see that the high lights and fine half-tones have already given up all their ink, while the deeper tones still look very flat. The paper should be allowed to drop back again gently, and then the other layers. Then the pressure is increased by giving the central spindle about three or four half-turns, as, after the first impression, there is little danger to either bromoil or transfer through heavier pressure, and the pack is again passed through the rolls, but only twice, once in each direction. If the print is now examined again it will be found that the full half-tones and the lighter shadows are already transferred, but that the deep shadows do not appear in full tones. Then the printing is repeated with still greater roll pressure, three or four more half-turns of the central spindle; again the pack should only go twice through the rolls. Another examination should now show the print in full vigor in all its details. If, however, it should happen, especially when using rough papers, that the shadows do not yet appear quite deep enough, one should print again twice with increased pressure. All the ink which was on the bromoil print will now be transferred to the paper; if the printing was carried out properly the bromoil will look as if it had not been pigmented at all.

It should never be forgotten that the rolls ought never to be so strongly screwed down that they can only be started by great effort; they must always move easily, and with little muscular effort. Repeated slow passage of the press-pack through *moderately tightened rollers*

is always *more advantageous than a single printing under very heavy pressure.*

Heavy pressure not only endangers the bromoil, since the gelatine film, especially in the lights, adheres to the paper and tears when removed, but the transfer also, because the water, pressed out quickly and with great force, is deposited in the ink in the form of fine globules. After evaporation, which takes place very quickly, these places show curious, light, circular or elliptical spots, which produce the general impression of a picture painted in the pointillist manner — an undesired effect which, however, may occasionally be satisfactory.

It is very advisable to turn back the central spindle before finally taking the press-pack out of the machine, as otherwise one may uselessly and prematurely ruin the components of the press-pack.

The bromoil can be immediately immersed in water and again pigmented — as was done at first, or with different ink. This process may be repeated until the paper breaks down, with careful treatment in printing and suitable stout bromide paper, up to twenty times.

If the pressure of the rolls was too great, then the film shows blisters, which at first, and if they only appear here and there, are harmless, even when they occur on important parts of the print. If their number increases, however, it is better to make a new bromoil.

If the bromoil is to be kept for future work, then it should be allowed to become bone dry, in order to dissolve off any grease with benzol or other solvent, exactly as is done with a bromoil print in defatting. Prints thus treated can be used again after any lapse of time.

This method of printing is proper for either monochrome or polychrome impressions.

In conclusion the fact may be mentioned — first published in France, I believe — that bromoil prints, which in the course of making have been soaked in ammonia water, can be more easily transferred, and that there is less danger of the bromoil print and the paper sticking together, even with very strongly absorbent papers.

Robert Demachy has stated that transfers can also be prepared by removing the ink, not by a press, but with a solvent, such as benzol, by moistening the paper with this solvent and then bringing it into contact with the pigmented bromoil. My experiments in this direction could not be brought to a conclusion, as at the time I undertook them a suitable solvent was not available. I had only succeeded in determining that it is very important that the bromoil print should be allowed to dry thoroughly — from six to eight hours — and that then a less volatile solvent than benzol, such as heavy benzine, or best of all, gasoline or petroleum ether, can be used. If the bromoil print is laid on a sheet of paper and moistened with this, then pressure in a printing frame is sufficient in order to obtain a transfer. A machine is not required.

The pictures which I have obtained in this way have not been satisfactory, up to the present time; the cause of the failure obviously was that I lacked experience as to the necessary degree of moistening and the duration of contact. As stated, for lack of materials, I was obliged to discontinue experiments.

COMBINATION TRANSFER. — The process just described permits the transfer of all that was in the bromide print. If, however, it is a question of improving the inadequate gradation of a bromide print from a long-scale negative, we must use other means. Bromide

paper has only a limited scale of tones and therefore cannot reproduce the full modulation of a negative of full gradation. If the details in the shadows are to be retained in such a case, then the high lights will appear bare; if well-modeled high lights are desired, then we risk blocked-up shadows.

This difficulty has been largely overcome by Dr. Emil Mayer, by the introduction of a combination printing process for bromoil transfer, of which full details will be found on page 125. He starts from the above-mentioned fact that bromide paper does not reproduce the whole scale of tones of the negative, when this is too long, and therefore divides the tones of the negative into two parts by exposing one bromide print only for the shadows and the adjacent half-tones, and a second merely for the high lights and the lighter half-tones. He then transfers these two constituent prints in superposition and thus obtains the full gradation of the negative. It is thus possible therefore to lengthen the scale of tones *of the negative*. If, however, it is merely desired to extend the scale of tones of *the bromide print*, then it is sufficient to make the combination transfer from one print only, which must, however, be prepared in a way differing slightly from the usual.

I will not repeat here the theory of the two kinds of combination transfer, which may be found in an earlier chapter by Dr. Mayer (page 125), but in giving my own instructions for the practical performance of the process, I have essentially adhered also to Dr. Mayer's instructions, with his full permission.

COMBINATION PRINTING FROM TWO BROMOILS. — It has frequently been pointed out in the literature of the gum process that the best positive transparencies may

be obtained from a *long-scale* negative by making *two* positives from the one negative and then bringing these two positives into superposition; for this combination, one positive must be *fully exposed* and *developed soft,* the second, on the other hand, kept *hard* by a *very short exposure* and *full development.* If these two positives are laid film to film, "there is obtained," as von Hübl wrote as early as 1898, *in applying this method to gum printing* (see Eder, *Das Pigmentverfahren, der Gummi-, Oel- und Bromöldruck,*" Halle, 1917), "a result which often surpasses, in truth and fidelity to the original, a normal print from the negative. In such a combined print the high lights are derived from the short, the shadow details from the long-scale negative; the two images supplement each other and reciprocally increase the brilliancy. It is also possible to make good defects in the negative or the printing process."

This same principle is used in our process, although not exactly as in gum printing. The process itself is not difficult. It is necessary to make two perfectly registered bromide prints, which is most easily done by always placing the printing frame in the same position in filling, as for instance by fitting the same two sides into a rigid iron angle fastened on a drawing board, or, in enlarging, by using a right angled piece of strong, black card glued to the enlarging easel, and fitting the paper into this angle. I have prepared a simple and absolutely certain arrangement for securing registering prints by having a beveled-edge rectangle cut out of sheet iron 2 mm ($\frac{1}{16}$ in.) thick, the opening being somewhat smaller than the bromide paper. Thus, for instance, for 24 × 30 cm ($9\frac{1}{2} \times 12$ in.) paper, the cut-out is only 23 × 29 cm ($9\frac{1}{16} \times 11\frac{3}{8}$ in.). *Care must be*

taken in this work, however, that the bromide paper for both prints is taken from the same packet, since only identical papers expand absolutely equally in the baths and contract equally in drying. Although the paper used by the manufacturer may be of the same quality, yet it may not always be handled exactly the same in coating, so that a registration of the prints may not be possible when one uses paper prepared at different times.

The *first* print is now *very fully* exposed and developed soft, just long enough so that the high lights and upper half-tones are well brought out. When this is attained, development is stopped *without paying attention to the shadows,* which will be full of detail, but weak.

The second print is exposed as briefly as is required for the perfect reproduction of the shadows, with the use of a hard-working developer. As soon as the shadows appear in full depth, the print should be rinsed and fixed. The print then shows, besides the shadows, only the transition into the half-tones. It is not easy to give more accurate instructions for the preparation of the bromide prints, as the work must be carried out differently according to the negative. Only, *as a hint,* and nothing more, it may be stated that in a print where exposure of about twelve seconds was required for the complete printing of the high lights and half-tones, the shadow print needed only about three seconds, or about one-fourth the exposure. This ratio obviously alters in accordance with the depth and quality of the shadows in the negative, and must be left to the feeling and experience of the worker. When the two prints have been developed, fixed, washed and dried, they should be tested for equality of size by measurement with a millimeter scale. Then rule pencil lines around the edges

of the prints very exactly, and treat them in the usual way in the bleaching bath, the second fixing and washing. When thoroughly dry the pictures should be cut along the pencil lines with absolute accuracy, and their registration again tested. It is advisable to write on the back before bleaching "high light print" and "shadow print."

Pigmenting is effected as usual. Practically, one should always begin with the *high light print,* as this is intended to give the finest modeling in the high lights and half-tones, while the shadows are treated so that they show all the details, but no depth. This order of working leaves one absolutely free in the treatment of the fine tones, independent of the depth of the shadows. These depths are produced in the transfer in any desired strength by means of the second bromoil. If, however, the work is started in the reverse way, by printing the shadows first, then the half-tones and high lights must be adjusted to the existing depth, which may produce a dislocation of the tone values, even to a destruction of the whole desired effect. The best way is therefore to direct the whole attention in the first place to the lighter parts of the picture, and to suit the shadows to these.

When the *high light print* is completed as desired, the transfer may be made. The bromoil print is placed on the location guides, described in the previous chapter on "Printing." Then the transfer paper is placed on its guide and pencil lines very carefully drawn across the edges of the back, on to the pasteboard. Then it is printed. The picture will now appear in full beauty as regards the lighter tones, but obviously as a whole will be flat, since the shadows are grey and without depth.

Now we proceed to the working up of the shadow print, which when complete should appear absolutely bare of high lights and *light* half-tones. No protective measures to prevent the sticking of the non-pigmented parts to the transfer paper are necessary, as these white portions of the shadow print are already covered from the first transfer. The print is now placed exactly on the marks made on the plate-mark pattern before the first transfer, the first transfer also brought into the same position by the marks on its back and their prolongations, which is very simple in practice, and is then printed. The transfer now shows the full gradation of the negative, or the sum of the gradations of the two bromide prints, which, however, will be enhanced in effect by the plastic softness produced by the double printing. If it should be necessary to strengthen any part of the print, to deepen any shadow, we can again pigment the necessary portion of the proper bromoil and transfer it to the picture by a third printing, for it is thoroughly practicable to superimpose as many impressions as may appear necessary from an artistic standpoint.

This method of combination printing from two bromoils is the best attainable result in the present state of the art, but contains also the germ of future developments, especially as regards color photography, which problem appears to me to be most easily solvable in this, purely artistic, way. Only it is necessary to find an artist who can conduct the various printings with such fine color sense that the final result will actually produce the impression of a *work of art* in color, not that of a colored photograph, which has unfortunately hitherto been the case with all experiments in this di-

rection. This is obviously nothing more than a hope for the future. For the present we must content ourselves with what has actually been attained, which is no more and no less than to bring us close to our aim, ability to consider and use the photographic plate merely as a foundation for our graphic art.

COMBINATION PRINTING WITH ONE BROMOIL. — It is frequently not easy to reproduce perfectly in the transfer the whole scale of tones present in a given bromide print; or at least in many cases a high degree of skill must be employed. It is consequently often very much simpler to make *two transfers* from the *same* bromoil, one being inked up for the light parts, while the other is used to fill out and deepen the shadows.

The practical execution of the process is as follows: the bromide print is swollen in the normal way and pigmented with a *soft ink* suitable for the high lights, the shadows being very lightly inked. The transfer obtained from this bromoil print shows all the details in the high lights, with grey shadows. The print is now immersed in cold water to swell again and then inked up with a *hard ink*, so that only the shadows and the adjacent half-tones are fully worked up. This print is now transferred to the same paper, so that a transfer is obtained in which the scale of tones of the bromide print is considerably lengthened.

A second method of making two transfers from one bromoil is first to swell it normally, then ink up thoroughly and transfer. It is then highly swollen with ammonia and the shadows only treated with hard ink. The result of the second transfer on the first one is again full gradation in the print. This method, however, is not very advisable, as the print cannot be used

again if the second transfer is not successful. It is better to adhere to the first method, and preferable to use two inks of different consistency rather than two differing degrees of relief.

If, however, the combination transfer from a single bromoil is to give the best possible gradation, the exposure and development of the bromide print must be properly done, the process being essentially that of Benndorf, referred to on page 143.

The bromide print must be fully exposed and developed very soft; the image then seems flat, and yet every gradation of tone present in the negative is actually shown in the bromide print. If a print thus prepared is treated with inks of two consistencies, the best results are obtained.

THE VALUE OF COMBINATION PRINTING. — With the aid of combination transfer it is possible to solve problems in the bromoil printing process, which were hitherto unsolvable, and Dr. Mayer correctly remarks at the end of his treatise: "The transfer process has advanced to the first place and in future in the hands of the expert, bromoil printing is likely to be considered as a process of secondary importance."

I was early convinced that transfer would replace bromoil printing and am absolutely of the opinion that combination transfer will do its share in making my opinion universal. Still I do not believe that it is necessary to use combination printing in all cases. I would especially warn the beginner against using it exclusively; he should rather endeavor to make simple transfers starting from a perfect bromide and a perfect bromoil print, for by this means he will attain much more certainty in printing technique. Only when he has abso-

lutely mastered this technique, should he begin experiments in combination transfer from one bromoil.

Every worker should endeavor to use the technique of combination transfer for the execution of an artistic idea, rather than for overcoming technical difficulties in single transfer.

Then it will, however, always give excellent results. Aside from the solution of such problems as views from a dark space into a brilliantly lighted distance, or pictures of falling water in conjunction with its dark surroundings, etc., it will be especially useful to the portraitist in treating his backgrounds.

Combination transfer from two originals will, however, be most valuable artistically, when there is a question of combining sharply defined parts of a picture with softer parts. Thus, for instance in a landscape, we may make a sharp print and, by the use of bolting cloth, one with soft outlines; the parts which it is desired to emphasize will be worked up on the former and artistic softening added from the latter.

Briefly, the possibilities are so many that they can hardly be indicated, not to speak of describing them in full. This is, besides, hardly necessary, for the worker who has reached full mastery of combination transfer is necessarily so far advanced artistically, that he will find out for himself all that is necessary.

RETOUCHING AND WORKING UP. — A good bromide print can only be prepared from a good negative. So says the expert bromide printer. The bromoil printer *requires* a faultless bromide print as the fundamental condition. The transferrer, finally, will not use an imperfect bromoil print for transfer.

I belong to the school which would produce a photo-

graphic picture only by purely photographic means, without, however, being too orthodox; I would not, therefore, repeat the whole laborious making of a bromoil print, because I might not think it photographic to spot out with water-color a small spot the size of a pin's head, or to remove a small particle of ink with the etching knife. This is actually not retouching, but there are people who consider these changes as such.

By retouching I mean the justly condemned excessive "working up" of a *positive* print, that is a change of values on the finished print. That should not be done.

Bromoil printing is still that exquisite process which permits the correction of false tones, the suppression of undesirable and the emphasis of the most characteristic details in the most extensive way *during the work.*

I consider it objectionable to leave all faults which occur during the long process of picture making, for the sake of convenience, to be improved on the positive print. But if it does become necessary to use retouching on the transfer, it can be done with a soft eraser. An excellent means of working up larger areas has been described by Dr. Mayer (see page 123), which consists in working on the transfer with the same brush and the same ink as was used in making the bromoil. Thus clouds may be imitated by pigmenting the white surface and then working in the clouds with the eraser, etc.

Since, however, this and other improvements can be carried out, not only as well, but even better on the bromoil print itself, it is advisable to do so much with the brush that nothing remains to be done on the transfer.

Drying. — As soon as the transfer leaves the press, it is finished, but as the ink is very easily smeared it is advisable to leave it exposed to the air for two or three

days. After the lapse of this time the ink has usually hardened.

Very heavily inked prints require from eight to ten days to dry and may be considered as absolutely dry when the oily sheen which can be seen immediately after printing, especially in the shadows saturated with ink, is replaced by a velvety, perfectly matt surface.

Retouching can be begun about one or two hours after it has left the machine.

A transfer should not be mounted, for it looks best as it is, if the margin is sufficiently large.

CONCLUSION. — The technical difficulties of making a good transfer are not small, and to overcome them requires a certain degree of skill in the worker, which other processes do not require to an equal degree. By "workers" I mean especially amateurs, not those professionally skilled in the graphic arts. After overcoming these difficulties, caused chiefly by the materials, there is a certain feeling of satisfaction in having actually produced a work of art. By using the different techniques of bromoil printing: soft ink, hard ink, sketch, and coarse grain, one can obtain transfers of such beauty as may confidently be said can be attained by no other process. There is unlimited possibility of variation; and this alone assures the bromoil transfer process preëminence over any other method of printing.

That a transfer can be used as a basis for working up with pastel and water-color need only be incidentally mentioned, because such work is outside of pure photography and it is unnecessary to express an opinion as to the artistic value of such productions in this place. The photographer should always adhere to the fundamental law: Do not forsake photographic methods.