

CHAPTER VIII

THE PREPARATION OF BROMOIL INKS

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EVERYONE who devotes himself to the higher aims of photography, and studies the works of painters, must learn to see with the artist's eye if he will apply his knowledge in pictorial presentation of his subjects. In the same way the bromoil printer should become more familiar with the working tools of the painter, and especially with the most valuable material at his command, the ink, than has hitherto been the case.

When we look back on the history of painting, we note the often-mentioned fact that not only the old masters of all schools, Italian, German and Dutch, but also the later generations till about the middle of the last century, ground their own colors. They did this not merely to be assured of the most perfect purity and thus absolute permanency, but also because they wanted to obtain the greatest possible brilliancy.

As regards the purity of the materials used — the colors and the mediums — there is no doubt that to-day, thanks to the high perfection of manufacturing methods, this can usually be depended upon; but as regards the brilliancy, no positive instructions of any kind for obtaining this have come down to us. The painters took their secrets with them to the grave. But as the result of exhaustive research, together with advances in the manufacture of colors, we can assume with some cer-

tainty that the masters of past times attained *vigor in their colors* chiefly by the finest possible grinding of the colors and by a relatively small addition of medium. "It may sound paradoxical," says Professor Th. Petruscheffsky in one of his treatises on the technique of painting, "*but it is, however, true, that in oil painting oil should be avoided as much as possible.*"

The old masters knew this and acted accordingly, and the modern manufacturer also knows it, and replaces any excessive quantity of oil in the medium, which is mixed with the pigments to bring them into a paintable form, by other substances, for instance turpentine, and certain resin solutions, which have no binding properties; during the work these substances evaporate and leave behind the color with very little medium.

These facts the bromoil printer must know, for he should also use colors from which he can get the very best possible results.

The ink is one of the most important parts of his equipment. This fact was fully recognized by English, French, and German manufacturers, and inks were obtainable that left nothing to be desired. At the outbreak of the war the position of affairs was immediately altered. It was not possible to use English and French sources of supply and the German supply gradually failed. What was furnished as ink for the oil process was suitable for anything else but that — a soft, smeary and smearing mess, which did not permit any finer working up of the picture, and required so high a relief that individuality in the work was excluded.

These conditions induced me to try and prepare the necessary inks myself, and after many trials and exhaustive experimental study of the manufacture of artist

oil colors I finally succeeded in reaching my goal.

INKS AND BRUSHES.— My starting point was a great desire to make a *hard* ink, since I recognized that this consistency was the necessary starting point to be able to use any degree of relief. I further desired to attain a mixture of color and medium which should be as perfectly homogeneous and as fine as possible, and moreover to provide a palette, which should not only satisfy all requirements of the bromoil printer, but also give him only fast colors, perfectly suitable for the transfer process and soluble in benzol.

Command of a *hard ink* — *which can be suitably softened to meet any need* — is very necessary to the bromoil printer, if *clean shadows* are to be obtained. As already mentioned, it has long been known among painters that the colors appear purer and more luminous when they contain as little medium as possible. In order to be able to apply such stiffly ground colors, the painters use bristle brushes, which do not produce the same results as hair brushes. Naturally there is nothing to prevent the bromoil printer from using *bristle brushes*, only they must fulfil certain requirements. The literature of bromoil printing gives many hints on this point, but I have not been able to locate a practical use of these brushes. Some years ago I had made, by a manufacturer who makes excellent hair brushes for our process, bristle brushes in stag's foot shape. The result was extraordinarily gratifying. These brushes do not drop their bristles nor do they suffer from the troublesome breaking off of the points, they do not pick up the dust and do not smear even when very soft inks are used, because the bristles, unlike hairs, do not cling together. They can be easily and thoroughly cleaned and are ob-

viously very lasting, and in addition cost only a fraction of what must be paid for really good hair brushes.

As regards the size one is not limited, as with the hair brushes, to small sizes, since the hog's bristle brushes can be made of any desired diameter, even 10, 15 or 20 cm or more (4, 6 or 8 inches or more) so that the working up of large prints is considerably facilitated.

Two conditions must, however, be carefully observed for good results. First, these brushes must actually be made from the *very finest cut* bristles and, before they are used, they must be *repeatedly and very thoroughly cleaned*, because they are very dirty when purchased.

The principal advantage of these brushes is that they *enable one to use considerably harder inks* than is possible with hair brushes, which results in *much greater clearness of the shadows*. When this clearness of the shadows is obtained, one can always use a hair brush for working up the finer half-tones and high lights. This is, however, not necessary, at least in the majority of cases.

I have *not* noticed any disadvantage in the use of these brushes; the gelatine has never been pierced, even in the highest reliefs.

Although I am averse to anything that may smack of advertising, yet I will state here the source of these brushes, because the expert manufacture of these tools, so important in our handicraft, is not found everywhere in equal perfection, and because I believe that it will be of considerable service to those wanting brushes. The brush manufacturer is Magnus Bühler, Wien VII, Breitegasse 4, Austria.

I might add a word here as to the cleaning of brushes in general, whether hair or bristle. It is usually recom-

mended to wash out the ink with benzol or similar solvent, carbon tetrachloride, trichlorethylene, etc. A really thorough washing is never obtained with these; and the brushes almost always give up a greater or lesser quantity of small particles of ink to the new print when used again. The following process is much better. The



FIG. 3

brush to be cleaned should be dipped into lukewarm water and then rubbed firmly on a piece of ordinary soap (soft soap is better), so that it takes up as much soap as possible. Then the soap should be worked up into a lather on the palm of the hand and washed off. If this is repeated a second time and the brush is then

rinsed two or three times in lukewarm water, repeatedly changed, the brush will be far cleaner than can be obtained in any other way. After it has been well rinsed and shaken out it should be put into its tube and hung up by the handle in a place free from dust to dry (see Fig. 3). This vertical position has the effect of facilitating the draining of the moisture from the quill base, where it otherwise collects. Any brush thus treated will be dry in a few hours. The finest hair brushes are not damaged at all by this treatment, which is commonly used by painters.

THE PREPARATION OF THE BROMOIL INKS.—The preparation of the bromoil inks is very simple. The following are necessary:

Linseed oil varnish of the thickest consistency;

Powder colors;

A rubbing plate;

A pestle;

A springy spatula (palette knife);

A stiff spatula, the so-called ink knife (putty knife).

The following sections will give the necessary information as to the properties and nature of each item in this small arsenal.

THE VARNISH.—Only such varnish should be used as is prepared from linseed oil and chemically pure. Its color should be light to brownish-yellow or at most reddish-brown. Dark brown or blackish-brown varnish points to adulteration. The smell is that of linseed oil and is not exactly pleasant, but it should not smell badly. In the latter case one may reckon with certainty on the addition of fish or resinous oil. One principal requisite of this varnish is that it should be absolutely *clear*. The varnish is produced of various consistency, from

quite fluid to quite viscous, and *this is one of the principal properties, to which the bromoil printer must pay special attention, for every degree of consistency demands and must have only one definite quantity of color*, otherwise the resultant ink will not satisfy the desired end. More as to this later.

I used for all my experiments and later for all actual mixing the linseed oil varnishes, No. 1 and No. 2 (chemically pure) of the firm of Kast & Ehinger, of Stuttgart, which have always given me excellent results, without failures. Excellent also is the somewhat less stiff "collotype varnish." But any other varnish, if it only has the right consistency and is not adulterated, must also give good inks, though great care must also be taken as to clearness and color.

Warning should be made against oils similar to varnish, which can be recognized by a cloudy appearance and a very unpleasant rancid odor. They harden very quickly and thus become useless and are very costly.

The stiff varnish is very viscous, like thick syrup. In the cold it thickens with the formation of a thin skin on the surface. On a hot water bath, it again obtains its original character. Well corked up, good varnish will keep for years; it even becomes better by long storage. It is most convenient to fill the varnish into small wide-mouthed bottles, holding from 20 to 40 g (about an ounce), with ground-in stoppers, as one can note its appearance at any time through the glass. In taking the varnish out of the bottle, care must be taken that none gets on the inside of the neck, or else the bottle can only be opened with difficulty through the varnish gumming it up.

POWDER COLORS. — Only such colors should be used

as are fast both to light and air. The following may be selected with absolute certainty:

For black: bone black, ivory black, crayon sauce;

For brown: burnt umber, burnt sienna, burnt dark ochre;

For yellow: cadmium, light and dark, yellow ochre, light and dark;

For red: English red, light and dark, Indian red;

For blue: indigo, ultramarine, cobalt blue;

For green: cobalt green, light and dark, Bohemian and Veronese earth;

For white tones: zinc white.

The bromoil printer obviously does not need all these. One representative of each group will be quite sufficient, and I should state that when colors are obtainable in both light and dark shades, the light one should always be chosen.

The colors must be very finely ground; it will not be necessary, or only exceptionally, to prepare the powder colors oneself, for they can be obtained commercially in every high grade store dealing in painters' materials. If, however, this becomes necessary, then the lumps of color should be crushed on a stone or glass with a flat muller, and the coarse granular masses thus formed kneaded with a little water, or, better still, some *alcohol* and then thoroughly ground. The mass should be allowed to dry thoroughly and the process repeated two or three times. *The finer the powder is rubbed up in this way the finer the tone it will give.* The coarse color powders, often found in drug stores, are not suitable for our purpose; they are used more for industrial purposes.

Aniline colors, or those brightened with anilines, should be absolutely avoided, as they stain the gelatine and

thus spoil the print. On the other hand I call the attention of all bromoil printers to the *pastel colors*, which can be used with excellent results. They offer many advantages over the powder colors, since among the hundreds of color shades, in which they can be obtained, it is easy to choose that which is most suited for the subject. The tints are ready to use, while with the powder colors the desired tint can only be obtained by mixtures. These colors have the further advantage of covering much more strongly, even to obtaining brush texture; they are somewhat more difficult to apply to the print, because of the fact that they are mixed with a medium which is from its nature not so well adapted to our process. Those, however, who have well mastered the brush technique, will easily overcome this small hindrance.

If the pastel colors are used one should only take those of reliable manufacture, such as those made according to Mengs' formulas, which are everywhere obtainable under the name of *Meng's pastel pencils*, though this does not mean that those of other makes will not give excellent results.

THE RUBBING PLATE. — For this we use a thick plate glass slab, ground on one side, about 15 by 20 cm (6 x 8 in.).

PESTLE OR MULLER. — A pestle of glass is the best. The head must be round, not flattish, and have a matt surface.

SPATULAS. — It is necessary to have a flexible spatula (palette knife) about 1 cm ($\frac{3}{8}$ in.) wide and a stiff one, an ink or putty knife, about 4 to 5 cm ($1\frac{1}{2}$ to 2 in.) wide.

Now that we have become conversant with all the necessary materials, I come to the:

PRACTICE OF INK GRINDING.—As I have mentioned above, the purpose of the work is to obtain an ink of as stiff a character as possible. To this purpose, after the vessel in which the varnish is kept has been allowed to stand at least 10 minutes in hot water, or an hour in winter, we remove from it by means of a wood or glass rod a very small quantity of the varnish, spread it on a glass plate and rub it with the pestle so that it covers a surface of 3 to four qcm ($\frac{1}{2}$ — $\frac{3}{4}$ sq. in.). To the varnish thus spread out we add with the flexible spatula a small quantity, about as much as will lie on the end of a pocket knife blade, of the powder color and rub it with the pestle until certain that the color is absolutely mixed in. If too little color has been taken, more should be added and rubbed again until a firm doughy mass is obtained which has a *slaty and not oily gloss*, and can scarcely be worked with the pestle. Now with the springy spatula the whole ink mass is pushed together from the edges to the middle to make a little heap, and the ink that remains on the pestle scraped off and added to it; the whole mass should then be again worked up with the pestle and this procedure repeated two or three times. Then the ink is ready. It must be so hard that a brush set into a small quantity of the ink that has been taken from the heap with the stiff spatula and spread out in a thin film, neither takes up the ink nor gives it up again to white paper. In order to make it fit for use, one must add to this thin film *one* small drop, not more, of pure linseed or poppy oil, petroleum, light copper-plate printing varnish, or medium, and mix it well with the ink with the stiff spatula. Petroleum can be highly recommended for the softening medium. One can use the ordinary lamp

petroleum, but the so-called purified petroleum is better. It ought only to be added to the ink drop by drop. Now the brush will take up and give up the ink. If it should not be sufficiently soft, the procedure should be repeated, but always carefully, so that too much linseed oil is not added and thus the ink made too soft. If we use the pastel instead of the powder colors it is not necessary to break these up first. Small pieces broken from the pencils dissolve readily in the varnish. It would seem permissible to assume that the whole work of dilution with linseed oil could be saved by not adding so much color to the varnish, but by proceeding with the inking-up as soon as the ink is taken up by the brush, *but this is not the case.*

As I have stated above under "Varnish," every degree of consistency of the varnish requires a definite quantity of color. If one adds too little color, the paste will be too soft for bromoil printing, and cannot be spread. Too much color is hardly possible with the stiffest consistency; the limit lies when the color no longer dissolves in the varnish. Too little, on the other hand, results in the ink smearing on the print. *It is, therefore, absolutely necessary in using very thick varnish to absolutely saturate it with color. Not going far enough in this direction, or the omission of the preliminary warming of the varnish, are the only sources of failure.* In working with varnish of lighter consistency, it will be necessary to stop the addition of color as soon as the slaty gloss appears.

If the grinding of the ink were to require as long as it takes to read this description, the waste of time would be considerable. Actually the whole work may be carried out in two or three minutes if one uses the

methods suggested, and after a little experience is gained, which soon comes after a few trials. Long before the water for the bromoil print is hot, the ink will be ready.

INK MIXING.—As it is not always possible to use existing colors, and it is necessary in many cases to alter the shades for artistic effects, the basic colors must be diluted with other colors. This can be effected in many ways, best by adding another color to the predominant color powder during the mixing. *Bone black* is specially valuable for this purpose. This is by itself an unpleasant color, for it is a discordant brown-black which can hardly be used alone. If other colors, however, are added to this bone black it produces beautiful tones. Thus, for instance, the addition of a minimum of blue (indigo or ultramarine) gives a *deep, velvety black*; if a *little* more blue is added, we obtain a beautiful blue-black. A little bone black mixed with burnt umber gives a fine *warm black*, and so on.

The tone of crayon sauce is especially beautiful, if it is used without the addition of any other color, and especially that quality obtainable under the name of *Sauce Velours* is particularly excellent.

Another kind of color mixture is that in which black is taken as *the fundamental color* (which is desirable when it is not desired to mix up ink for each print) and then instead of diluting the *stiff* ink with linseed oil or other diluent, an ordinary good copper-plate ink or even ordinary *oil colors* are used. By this method of working I can shade and soften in one operation, and it is highly advisable to use it when it is desired to obtain different tints easily. The method of mixing is very important and I will therefore give some examples. If

to the stiff black ink (bone black), I add a little indigo oil color, I have at once a deep black; the addition of vandyke brown or burnt umber gives a magnificent brown; a fine dark green is obtained with light cadmium; this dark green becomes blue-green when I add a little indigo. An admixture of caput mortuum shows violet tones; red tube colors, such as Indian or Pompeian red, ochre, etc., give various reddish brown nuances. These additions can be varied in manifold ways, dependent only on what tube colors are at hand. It is strictly necessary, however, that only the least possible quantity of tube color should be added, about as much as the head of a good-sized pin, to keep the ink from becoming too soft and going beyond the desired tint. When a suitable shade has been attained, all further dilution must be effected with linseed oil, petroleum, etc. When I specially recommended the Mussini or Fiedler colors, it was because they are prepared with resin oils and are therefore specially suitable for our purpose. But all other *good* oil colors can be used. When I write briefly only *oil colors*, I mean obviously *artists' oil colors*, and not others which may be used for other purposes than for artistic painting.

Finally the black may be diluted with linseed oil to the usable consistency of hard ink and also diluted on another part of the palette with oil color or copper-plate ink of another shade to the consistency of a soft ink, and then both colors may be mixed either on the print or in the brush.

Very fine gradations may also be produced as follows: the bromoil print is pigmented as usual to obtain as *clear* shadows and *clean* high lights as possible, with not too high a relief. When the print is completely finished,

it should be placed in a 2 per cent cold solution of ammonia, this allowed to act for two minutes and then rinsed for one minute in clean water. Then the print, which is considerably swollen, should be very carefully dried off, so that no ink comes off on the cloth, and the latter leaves no imprint of its structure. Now the whole print is gone over with a clean brush, on which is a *very little pure oil color*. By thus using light, transparent (*lasur*) colors, and only such ought to be used for this purpose, the print may be given an extremely delicate film of ink, through which the first image shines with full vigor. This gives an effect similar to that which the gum printer obtains by multiple printing.

According to whether the whole or only parts of the print are gone over with the "lasur" color, the most varied effects are obtained, such as deepening of the shadows, or lowering of the high lights, or both.

It is naturally impossible to describe this process exactly in print. Much must be left to artistic feeling, without which hair-raising color discords will probably be produced. Still, in order to give the beginner some starting point, it may be mentioned that black, brown or red tones may be easily treated with inks shaded towards grey, blue with pure grey, and so on.

The following summary of color mixtures for the beginner is also given: *red-brown* is obtained by mixing bone black, Indian red, and possibly dark alizarin lake; *violet* results from bone black with red and blue; *dark green*, from black, cadmium and blue; *brownish-green*, from black and indigo; *bright green*, from a little black with cadmium and indigo; *red chalk*, from black, brown and Indian red.

The individual tints will obviously vary considerably,

according as more or less of any given color is taken. This is entirely a matter of taste and must be left to the judgment of the individual.

When the stiff ink is ready on the glass plate, it is advisable to carry out all further manipulations on a white porcelain palette or tile, because the mixtures can be much more easily judged in tone and consistency on

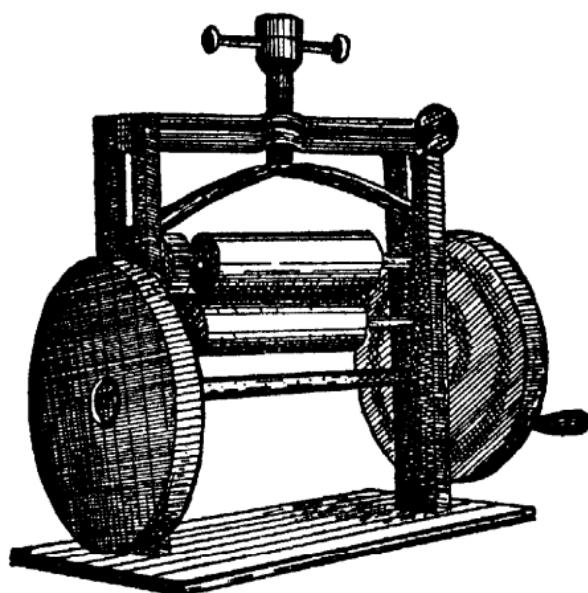


FIG. 4

these white supports. The mixtures are best made with the stiff spatula (putty knife).

PERMANENCY. — The permanency of home-made inks prepared by oneself is satisfactory if they are preserved from dust and air. My inks have kept for periods exceeding three months, with the most satisfactory results.

INK-GRINDING MACHINES. — For all ordinary pur-

poses the inks prepared in the manner just described are perfectly satisfactory. For inks, however, which must be extremely fine this method of mixing is not sufficient, therefore, I had a small machine constructed (Fig. 4), which consists of two rollers turning in opposite directions. The hand-ground inks are placed on these rollers and kneaded with strong pressure for two or three minutes. The whole machine is 25 cm high and 20 cm wide (10 × 8 in.), and can be conveniently fastened on the corner of any table. The resultant inks are of a fineness and quality which have not been bettered by large manufacturers.

ADDITIONS TO THE INKS.—If it is desired that the inks should dry matt on the bromoil print, so that the defatting with benzol may be omitted, then one should add to the home-made inks a small quantity of one of the following mixtures:

- (a) Beeswax 1 g (15 gr.); melt by heat and add with stirring 20 drops of linseed oil. As it cools a salve-like mass is formed. Or:
- (b) 1 g (15 gr.) kieselguhr (infusorial earth) rubbed up with linseed oil to a quite thin fluid paste.

It should be noted that these mixtures, in consequence of their content of linseed oil, make the inks softer.