

it with the oil. When the wax is all dissolved, the vessel should be filled with either oil or turpentine, which further dilutes and mixes the wax, and serves also to prevent it from congealing, so that it may mix with the graining colour thoroughly. This should be seen to, or else the wax is apt to remain in lumps; and when the colour is spread upon the work, for graining, the wax will be spread unequally, and will not dry in parts, so that it is absolutely necessary that the wax should be thoroughly mixed with the graining colour to produce good work. If soft soap is used, it should first be thoroughly worked up on a palette or a board with either whiting or patent driers; this breaks up the soap, and amalgamates it with the driers, and it will then mix properly with the graining colour. Another method is to break up the soft soap in water to a thick froth or lather; in this state it may be beaten up with water and thoroughly mixed with the oil colour. When the lime water is used, about 2 lbs. of slaked lime should be thoroughly mixed in a pint can full of water, and the lime allowed to settle; a portion of the water may then be added to the graining colour, and the two well stirred together until they are thoroughly amalgamated. If whiting is used, it should be ground in oil, and then mixed with the graining colour. Pure water will also answer the purpose. The wax is the most effectual, but there are some objections to its use. On the whole, pure water is preferable, for if it is well mixed with the oil colour, it helps it sufficiently to hold the combing until it sets; the water then evaporates and leaves no injurious effects behind, and the projection of the grain is less than it is if any other medium is used. The most useful colours for mixing oak-graining colour are raw and burnt Turkey umber, Oxford ochre, Vandyke brown, and burnt sienna. The first three, with the addition of ivory black, are all that is required for mixing any shade of graining colour. For light oak or wainscot graining colour, mix  $\frac{2}{3}$ ds linseed oil with  $\frac{1}{3}$ rd

turpentine; add a little Oxford ochre and raw Turkey umber in sufficient quantity, according to the shade required and amount of stuff mixed. Terebinte or liquid driers should be added, the quantities being regulated according to whether the graining colour is required to be quick or slow drying. A safe quantity to use, if the liquid drier is of the best quality, is about  $\frac{1}{2}$  oz. to a pint of colour. This will cause the colour to dry in about 7 or 8 hours, but twice the quantity may be used with safety if the colour is required to dry very quickly. Sugar of lead ground in oil may be used as a drier for graining colours, but the liquid drier is better. After adding the liquid driers, beat or stir well up together; add pure rain water in the proportion of  $\frac{1}{2}$  pint of water to 3 pints of oil and turps; beat or stir up until the whole is thoroughly mixed together, after which strain through a fine strainer or a double fold of fine muslin. The colour should be thinned until it works freely and lays on well, so that when the colour is being brushed over the work to be grained, it will lay on evenly, and be easily spread, and will look clean and of one uniform shade of colour. Care and cleanliness of working are necessary to the successful carrying out of this work; and it is essential that the colour, the brushes, and all working tools should be clean to begin with, and be kept clean.

*Oak in Spirit Colour.*—This is less durable than oak graining in oil, and is not therefore so much used for outside work, but it does not require so long a time in its working, as it dries rapidly. For the graining colour rub up whiting in turpentine, add enough burnt umber and raw sienna, dilute with turps, a little boiled oil, and gold size. Strain carefully, and it is ready for use. In laying this on, cover only a small part of the work at a time before combing, as it dries very quickly, and be careful to spread it evenly and thinly over the work. The combs used are made of steel, horn, or leather. After combing the veins and removing any superfluous graining colour from corners or small

parts of the work, let it stand for a short time. The flower of the wood has next to be imitated, by removing some portions of the graining colour with a small veining sitch. The spirit graining colour when used for this purpose must have a little turpentine added to it; apply with the sitch where the flower is required, then rub the places quickly with a piece of old flannel, which will remove the graining colour and show the light ground underneath. The light veins and half-lights are also obtained by similar means, either removing the graining colour or merely smudging it aside over the veins. The overgraining is performed in the manner described for the oak graining in oil.

*Graining Oak in Distemper.*—This process is now seldom used, although it stands exposure to the weather, without fading, for a great length of time. For colour, dissolve gum arabic in hot water, and make a mixture of it with whitening, raw sienna, and Vandyke brown ground in beer. Colour the work evenly, brush it down with a dry dusting brush, comb while the colour remains wet, then let it get quite dry. Put in the veins with a small brush dipped in clean cold water. After a few seconds run a dry soft duster down the work to remove the colour from the veins. Then lay on a thin coat of Turkey umber ground in table-beer or ale, put on with an overgraining brush. If too much gum is put in the colour it is likely to crack and blister, whilst if there is not sufficient the veins will not be clearly marked by the wiping out.

*Bird's-eye Maple.*—1. Graining colour—equal parts of raw sienna and burnt umber mixed in ale, of two thicknesses. First lay on an even coat of the thinner mixture, then with a smaller brush put in the darker shades, mottle and soften with a badger-hair brush. The eye is imitated by dabbing the colour whilst still wet with the tops of the fingers. When dry, put on the top grain in the most prominent places, and shade the eyes with a little burnt sienna. Some grainers use small brushes called maple eye-dotters, instead of the fingers, for

forming the eyes. Various forms of brushes are used for the mottling; some consist of short camel hair closely set, whilst to give the wavy appearance hog-hair mottlers are used, with long hairs, against which the fingers are pressed as the brush is drawn over the work, causing it to assume a variety of pleasing curves. The lines to imitate the heart of the wood are put in with a small brush, and the outer lines parallel to the heart are formed with the overgraining brush. Overgraining brushes for maple consist of a number of small sable brushes mounted at a little distance from each other in a frame, and resembling a comb in its appearance. 2. Grind equal parts of raw and burnt sienna in a mixture of water and ale. Coat the work evenly with this colour, then rub it down with a long piece of buff leather, cut straight at the edge and proceed closely against the work. Proceed for the imitation of the eyes and heart of the wood as before directed. 3. For outside work grind the raw and burnt sienna with a little of the patent driers, and then with boiled oil. Lay on an even coat, and rub down with a piece of buff leather. Soften, and when dry put on a top grain of burnt umber and raw sienna ground in ale. 4. Burnt umber or Vandyke brown laid on unevenly, darker in some places than others, after the character of the wood; a coarse sponge does for this purpose very well. When the colour is disposed over the surface it must be softened down with the badger-hair tool, and the knots put in with the end of a hog's-hair sitch, by holding the handle between the thumb and finger, and twisting it round; these knots may be afterwards assisted by a camel-hair pencil. A few small veins are frequently found in maple; these may be wiped off with a piece of wash-leather. When this is dry the second or upper grain may be put on; some of the first colour diluted will do for this second grain. To put on this grain use the flat hog's-hair brush, and the hairs combed out to straighten or separate them. As soon as the grain is put on, the softener should be passed lightly across the grain

in one direction only; this will make one edge of the grain soft and the other sharp, as it occurs in the wood. After the second grain is dry it may be varnished.

*Mahogany*.—1. Vandyke brown and a little crimson lake ground in ale laid on, allowed to dry and then smoothed, forms the ground. Then lay on a second thicker coat, soften with a badger-hair brush, take out the lights whilst it is wet, and imitate the feathery appearance of mahogany heart. Soften, and top grain with Vandyke brown laid on with an over-graining brush of flat hog-hair combed into detached tufts. In softening, be careful not to disturb the under colour. 2. Grind burnt sienna and Vandyke brown in ale, lay on a coat, mottle with a camel-hair mottler, and soften. When dry, overgrain as above.

*Pollard Oak in Distemper*.—The ground is a mixture of vermilion, chrome yellow, and white-lead, to a rich buff. The graining colours are Vandyke brown, a little raw and burnt sienna and lake, ground in ale. Fill a large tool, lay on an even coat, and soften with the badger-hair brush. Take a moistened sponge and dapple round and round in circles, then soften lightly, and draw a softener from one set of circles to the other while wet, to form a number of grains, finish the knots with a hair pencil. When dry, put the top grain on in a variety of directions, and then a coat of turpentine and gold size mixed. When this is dry, glaze with Vandyke brown mixed in beer.

*Pollard Oak in Oil*.—Ground the same as for pollard oak in distemper. Graining colours, equal portions of Vandyke brown and raw sienna, ground separately in boiled oil very stiff; mix them together, and thin the whole with spirit of turpentine. With a large brush lay on a thin coat, and, while wet, take the flat graining brush dipped in the colour, and dapple in various directions; then dip the brush into burnt umber thinned with spirit of turpentine, and form the knots. When the colours are set, dip a flat brush into a thin glaze of burnt umber, and put the grain on in a curly

direction. Have enough oil in the colours to bind them, and finish only a small part of the surface at once, in order to keep it moist. For making the knots a cork should be held on to a patch of the dark colour, and twisted round between the thumb and finger. The heart of the wood should be taken out with a graining sitch.

*Satin Wood*.—1. Graining colour.—Equal parts of raw umber and raw sienna, a little whiting and burnt sienna, all ground in ale. Colour evenly, and soften, then mottle and feather same as for mahogany. Soften, and allow to dry; overgrain with the same colour. 2. Grind raw sienna and whiting in ale very thin, and colour the surface. Soften whilst wet, and take out the lights with a mottling brush; when dry, overgrain with the same colour applied with a flat brush.

*Yew Tree*.—Ground, reddish yellow. For graining colour, grind equal parts of Vandyke brown and burnt sienna in ale, with a little raw sienna. Lay this colour on evenly when the ground is dry, and soften. Cut a piece of cork to a tolerably sharp edge, rub it across the work, and soften the same way as the grain, as in curled maple. When dry, dab the work over with the graining colour on the tips of the fingers to form the knots; shade them underneath with a camel-hair brush. When dry, overgrain.

*Rosewood*.—Ground, chrome yellow, vermilion, and white-lead. For the graining colour grind ivory black and burnt sienna very fine, mix, and lay on, then soften. When dry, put on the top grain in a curly figure, with a small graining brush well filled with ivory black. Shade up the knots with a camel-hair brush, and finish with a glaze of rose-pink.

*Hair-wood*.—1. First lay on a coat of light grey, of white-lead ground in boiled oil, add a little Prussian blue, and mix with turpentine. For ground colour use the same paint made much thinner with turpentine, laid on as soon as the first coat is dry. The ground colour must only be applied on a small piece at

a time, as it must be grained before it dries. For the graining use some of the ground colour, to which add a little Prussian blue, apply this with a feather, in long veins. Overgrain with the ground colour. 2. Mix white-lead and turpentine, and add a little Prussian blue, for the ground colour. For the graining colour, Prussian blue and raw sienna ground in ale. When the ground is dry, lay on a thin coat of the graining colour and soften; put on the long grain with a mottler drawn across the work. Soften, and overgrain in a perpendicular but wavy figure.

*Graining Roller.*—This tool consists of a roller of wood or metal mounted on a spindle, to which are attached a frame and a handle. Around the wooden roller is a wrapper of leather, on which is cut or stamped an imitation of the grain of a certain wood. The leather used for the roller is of thick hide. The pattern is sketched on one side, and then the ground is cut away to a certain depth, just as a block cutter would do for printing. In some cases the strip of leather is made fast to the roller, and only just covers it; in other cases the leather will be three or four times the circumference of the roller. The distemper graining colour is brushed over the work to be grained, and, while it is wet, the roller, which has previously been damped with a wet chamois leather, is passed over it, and as the roller passes along it takes up the colour in patches of the exact shape of the pattern on the roller used. This is then softened with the badger-hair softener, and overgrained. By a judicious use of these rollers, using only a part of the circumference, and changing the direction, the patterns may be obtained in great variety. The mottle of satinwood, mahogany, Hungarian ash, and birch is well imitated by these rollers, and also the beautiful feathers or curls in Spanish mahogany and satinwood. The mottle of these woods has very little variety, so that one or two patterns suffice for all; and this class of woods is peculiarly suitable for imitation by these rollers. To use the rollers for the imitation of mahogany,

satinwood, birch, and maple, lay the colour, mixed in beer, on the surface, pass the roller over it whilst it is wet, soften, and overgrain with a hog-hair overgrainer, previously combed to separate the hair. The roller should occasionally be passed twice over the same place, and in some parts plain spaces left, so as to prevent a repetition of the patterns; put in the maple eyes by hand in the usual way. Before overgraining the graining should be covered with a coat of turpentine, gold size, and a little varnish to bind it, so that the colour may not be removed by the overgraining. For oak lay the colour on as regular as possible, and comb as in ordinary work, a little common flour paste being added to the water colour, to enable it to stand the comb. Then pass the roller over it, and the badger, in the same direction as the combing. Overgrain same as mahogany, after the application of the mixture of gold size, varnish, and turpentine. The rollers must be kept quite clean, and free from grease or oil. Before commencing work, wet the rollers thoroughly with a sponge and water, and rub them with a wash-leather or dry cloth, so as to remove any water remaining on the surface. Whilst using the rollers, have a piece of wash-leather at hand, over which they should be frequently passed to keep them quite clean, and prevent the accumulation of colour on their surfaces, which would clog up the pattern. After use, wash them well with a brush and water, and let them dry gradually; do not apply heat, as that is likely to crack the surface.

*MARBLING ON WOOD.*—*Verde Antique.*—If the work is new, lay on a coat of dark lead oil colour. When dry, smooth with glass-paper, and lay on a coat of black paint. When the ground is dry, mix some white-lead with water and a little beer. Lay this on in large streaks. Fill up the spaces left with veins of lampblack, finely ground in beer, thus covering the whole surface of the work. While still wet soften with a badger-hair brush, so as to cause the veins to run into one another. On the darkest parts of the work lay dabs of

white, carelessly applied, to imitate fossils, and dab over the light parts of the work with the black colour for the same purpose. With a thin flat graining brush, or a feather, dipped in the white, form small veins over the black; a few dark blue wavy veins may also be put on. When dry, glaze with a thin coat of raw sienna and Prussian blue, ground in spirit of turpentine and mixed in copal varnish. A little emerald green added here and there heightens the effect.

*Oriental Verde Antique.*—Lay on a ground of black in oil. Mix white-lead in oil, thinned with turpentine for the graining colour. Lay this on in broad transparent veins of irregular depth of colour, and whilst wet dab it over with a piece of wash-leather in different parts to imitate fossils; then with a small piece of cork, twisted round on the work between the finger and thumb, produce a number of little spiral figures of various sizes and shapes. Cut notches on the top of a feather, dip it in the white, and pass it over the black ground in zigzag and fantastic veins, with occasional sharp angles. Let all the work get quite dry, and then glaze with green, in some parts with Prussian blue, in others with raw sienna, leaving some portions untouched. When dry, wash with beer, dip a feather into the whitening ground, and draw fine veins. To finish, give a coat of glaze, made of a little Prussian blue and raw sienna, mixed in equal parts of boiled oil and turpentine, leaving some of the white veins unglazed.

*Jasper Marble.*—Mix the ground the same as for mahogany, with red-lead, Venetian red, and a little chrome yellow, thinned with equal parts of oil and turpentine; lake or vermilion may be substituted for the Venetian red, if a brilliant tint is desired. Whilst the ground is wet dab on some spots of white, soften with a softening brush, and other colours may be applied in the same manner. When dry, put on the veins with a camel-hair brush.

*Black and Gold Marble.*—Ground, deep ivory black. Put on veins of white-lead, yellow ochre, and burnt and raw

sienna, with a camel-hair brush. The spaces between the veins must be glazed over with a thin coat of grey or white, over which pass a few white veins. The veins may also be put on with gold leaf. Another method is to have a yellow ground, streaked with broad ribbons of black, in which fine veins are obtained by drawing a sharp piece of wood along them whilst wet, so as to expose the yellow beneath.

*Sienna Marble.*—1. Ground, Oxford ochre and white-lead. Use burnt and raw sienna, white, black, and a little lake, for marbling. These colours should be laid on as a transparent glaze, and marked and softened while wet. The colours should be properly softened with a badger brush. 2. Ground, raw sienna or yellow ochre. When dry, mix raw sienna with white-lead, have ready also some white paint, put in broad transparent tints of white and yellow, and while wet blend them together with a softener. Mix Venetian red and a little black, and put in some broad veins in the same direction as the patchy tints run; for the darker veins take a mixture of Venetian red, lake, and black, and draw them over the first layer of veins with a feather, in fine threads, running to a centre, and in transparent veins in different directions. Mix some Prussian blue and lake, and put in the darkest and finest veins over those before laid on. Put in a few touches of burnt sienna between the fine veins, which are formed into small masses. All the colours should be ground in spirit of turpentine and mixed with sufficient gold size to bind them.

*Dove Marble.*—Ground, lead colour, of which it will be necessary to give two or three coats. If the work is new, let it dry hard, rub it smooth with fine glass-paper after each coat, and do not rub the paint off the sharp edges of the wood. For the marbling, take lead colour, such as used for the ground, thin it with turpentine, and rub a light coat over a small part of the work; and with a whitish colour form the small specks or fossil remains. Proceed, piece by piece, till the whole surface is covered,

being careful to paint but a small part of the ground at once, so that the colours may have sufficient time to blend together while wet, otherwise the work will appear harsh. Then with a small sash tool, put in faint, broad veins of the thin ground colour, and numerous very fine veins over the whole surface of the work, crossing each other in every direction. Then make the colour a little lighter, by adding white-lead, and with a feather pass over the broad veins in the same direction, forming streams of threads. With thin white, and with a camel-hair pencil go partly over the same vein with short thick touches, then with a fine striping pencil. When the work is hard, it should be smoothed with very fine glass-paper before being varnished. The first layer of veins should be very faint, so as to be scarcely perceptible; for, as the lighter shades are put on, the former veins will appear sunk from the surface of the work, which will give a good effect where the work is exposed to close inspection.

*Blue and Gold Marble.*—Ground, a light blue; when dry, take blue with a small piece of white-lead and some Prussian blue, and dab on in patches, leaving portions of the ground to show between. Blend together with a softener; next put on white veins in every direction, leaving large open spaces to be filled up with a pale yellow or gold paint. Finish with fine white irregular threads.

*Italian Marble.*—Ground, a light buff. For marbling, mix stiff in boiled oil white-lead, Oxford ochre, and a little vermilion; grind burnt sienna very fine in boiled oil, and put it into another vessel; mix pure white stiff in oil, and keep this also separate. Thin these colours with turpentine, and have a brush for each. Take the buff brush moderately full of colour, and dab it on in patches, varying as much as possible; take another brush and fill in the spaces between with sienna. With a softener blend the edges together, making them as soft as possible. Draw a few thin white veins over the work with a hair pencil, run in a few thin lines of sienna, and soften.

*Black and White Marble.*—White ground, and with dark veins, put on with a marbling crayon, and softened while the ground is wet. Or, when the ground is dry, cover it with a thin coat of white-lead, and put the veins in with a camel-hair pencil. Blend while wet.

*Granite.*—1. Grey ground, with white and black spots. 2. Venetian and white for the ground, with white, black, and vermilion spots. The spots are put on in several ways; a sponge may be charged with the marbling colour and dabbed on the work, or a common brush may be struck against a stick held at a little distance from the work, so as to throw off blots and spots of colour.

*Porphyry.*—1. Ground, pale-brown and rose-pink. Grind vermilion and white-lead separately in turpentine, and add a little gold size to each colour to bind it. More turpentine must be added before the colour is applied. When the ground is dry, fill a large brush with vermilion, squeeze out nearly all the colour by scraping the brush on the edge of the palette knife; hold a rod in the left hand, strike the handle of the brush against it, so as to throw small red spots on to the work till the surface is covered. Make the colour lighter by adding white-lead, and use as before. Then with clear thin white throw on very fine spots, and when dry put in a few white veins across the work. This marble may be imitated in distemper in precisely the same manner as in oil. 2. The ground is Venetian red, with a little vermilion and white. For marbling, add a little more white to the ground colour, and sprinkle over the first coat. When dry, repeat the splashing with a mixture of Venetian red and vermilion, and then with white in very fine spots. Form opaque white veins across the work, and transparent threads in various directions. This must be done when the work is dry and hard, with a sable pencil, and the thread drawn with a feather. For each separate colour use a different brush.

*Paper.*—*Ivory Paper.*—The pro-

erties which render ivory so desirable for artists are, the evenness and fineness of its grain, its allowing all water colours laid on its surface to be washed out with a soft wet brush, and the facility with which the artist may scrape off the colour from any particular part, by means of the point of a knife or other convenient instrument, and thus heighten the lights in his painting more expeditiously and efficaciously than can be done in any other way. These advantages are obtained in the paper made according to the following receipt, without any of the disadvantages of ivory, such as its limited size and changeable colour. Traces made on the surface of ivory paper by a hard black-lead pencil are much easier effaced by india-rubber than from common drawing paper, which, together with the extremely fine lines which its hard and even surface is capable of receiving, peculiarly adapts it for the reception of the most delicate kind of pencil-drawing and outlines. The colours laid upon it have a greater brilliancy than upon ivory, owing to the superior whiteness of the ground. Take  $\frac{1}{4}$  lb. of clean parchment cuttings and put them into a 2-quart pan, with nearly as much water as it will hold; boil the mixture gently for 4 or 5 hours, adding water from time to time to supply the place of that driven off by evaporation; then carefully strain the liquor from the dregs through a cloth, and when cold it will form a strong jelly, which may be called size No. 1. Return the dregs of the preceding process into the pan, fill it with water, and again boil it as before for 4 or 5 hours; then strain off the liquor, and call it size No. 2. Take three sheets of drawing paper—outsides will answer the purpose perfectly well—wet them on both sides with a soft sponge dipped in water, and paste them together with the size No. 2. While they are still wet lay them on a table, and place them upon a smooth slab of writing slate somewhat smaller than the paper, turn up the edges of the paper, and paste them on the back of the slate, and then allow the paper to dry gradually. Wet as before three more sheets of the same

kind of paper, and paste them on the others, one at a time—cut off with a knife what projects beyond the edges of the slate, and when the whole is perfectly dry, wrap a small piece of slate in coarse sand-paper, and with this rubber make the surface of the paper quite even and smooth. Then paste on an inside sheet, which must be quite free from spots or dirt of any kind; cut off the projecting edges as before, and when dry rub it with fine glass-paper, which will produce a perfectly smooth surface. Now take  $\frac{1}{2}$  pint of the size No. 1, melt it with a gentle heat, and then stir into it 3 table-spoonfuls of fine plaster of Paris; when the mixture is complete pour it out on the paper, and with a soft wet sponge distribute it as evenly as possible over the surface. Then allow the surface to dry slowly, and rub it again with fine glass-paper. Lastly, take a few spoonfuls of the size No. 1, and mix it with three-fourths its quantity of water; unite the two by a gentle heat, and when the mass has cooled, so as to be in a semi-gelatinous state, pour one-third of it on the surface of the paper, and spread it evenly with the sponge; when this has dried pour on another portion, and afterwards the remainder; when the whole has again become dry, rub it over lightly with fine glass-paper, and the process is completed; it may accordingly be cut away from the slab of slate, and is ready for use. The quantity of ingredients above mentioned is sufficient for a piece of paper  $17\frac{1}{2}$  by  $15\frac{1}{2}$  in. Plaster of Paris gives a perfectly white surface; oxide of zinc mixed with plaster of Paris, in the proportion of 4 parts of the former to 3 of the latter, gives a tint very nearly resembling ivory; precipitated carbonate of barytes gives a tint intermediate between the two.

*Manifold Writing Papers.*—The white paper is only very fine thin writing paper. The black is soft paper, prepared by being smeared with a composition of grease and plumbago or lampblack; this mixture is allowed to remain on for 12 hours, and the paper then wiped smooth with a piece of wool

or cotton-waste. Place white paper over black, and write with a blunt point.

**Enamelled Paper.**—1 lb. of parchmen. cuttings,  $\frac{1}{2}$  lb. of isinglass, and  $\frac{1}{2}$  lb. of gum arabic, in 4 galls. of water, are boiled in an iron kettle until the solution is reduced to 12 quarts; it is then removed from the fire and strained. The solution is divided into three parts of 4 quarts each; to the first portion is added 6 lbs. of white-lead, ground fine in water; to the second portion is added 8 lbs. of white-lead, and to the third is added 6 lbs. of white-lead. The sheets of paper are stretched out upon flat boards and brushed over with a thin coat of the first mixture with an ordinary painter's brush; the paper is then hung up to dry for 24 hours. After this the paper is ready to receive a coat of the second mixture, and again hung up to dry for 24 hours; the paper is then treated in the same way with the third mixture, and dried for 24 hours. After this it receives a high gloss, which is obtained by laying the work with its face downwards on a highly-polished steel plate, and then passing both with great pressure between a pair of powerful rollers. It is to be regretted that this enamelled surface is not very durable, as it comes off after wetting. To prevent this, a solution of some resinous substance may be added in the last operation.

**Parchment Paper.**—Dip ordinary unsized paper for 5 or 6 seconds into dilute sulphuric acid, and wash with extremely weak ammonia.

**Test Papers** are prepared by uniformly wetting sheets of unsized paper in solutions of litmus, buckthorn berries, Brazil wood, or other particular colouring matter required.

**Lithographic Transfer Paper.**—Make strong separate solutions in hot water of gum arabic 2 parts, by weight; starch, 6; alum, 1. Mix, and whilst moderately hot, give the paper two or three coats with a brush, allowing each coat to dry before the next is applied; finish by pressing. Another plan is to smear the paper with several cold coats of thin size, and then use solutions of white

starch and gamboge water, allowing each coat to dry as before. Paper thus prepared is written on with litho. transfer ink, the back wetted, placed on a clean stone, and run through the press, when a reverse copy is obtained, which can be printed from in the usual way.

**Wood Pulp for Paper.**—Paper-makers at the present moment are surrounded with many difficulties, owing to the high price of materials and the unremunerative price of paper. Wood pulp has lately had a good deal of attention; it is now about the cheapest thing available, but must be worked with great care, or it will give a great deal of trouble. It requires to be worked in an engine by itself, unmixed with other materials; the roll should never under any circumstances be allowed to do anything but clear the stuff. Bleach is poison to it, and it requires more t'rating if for printing paper than other material; a good dose of ultramarine and roseine making it a delicate purple-grey; if used in conjunction with straw it entirely destroys the harsh crackling feel of paper made from a large portion of straw; and, lastly, it absorbs hardly any power, and will help the turn out more than anything else, waste-papers not excepted. The greatest trouble to contend with in wood pulp is the uncertainty of moisture; this is a constant source of annoyance, and leads to disputes between the vendor and consumer. Some pulp invoiced at 50 per cent. moisture will often be found to contain 70 per cent. or even more. This, of course, upsets one's calculation of the cost of dry stuff or yield in paper. Makers of wood pulp intended for the open market should, therefore, sample their bales, and having dried the samples by artificial means, carefully ascertain the percentage of moisture contained, by deducting net weight of dry pulp from gross weight of pulp in bale, and invoice their goods faithfully as per sample. Consumers must not forget, however, that pulp stored in a damp place will absorb moisture from the atmosphere, whilst if stored in a warm dry room the bales will lose weight. The invoices would



be thus all the more reliable if the vendor stated the percentage of moisture in the pulp at a certain named temperature.

**STAINING PAPER.**—*Yellow.*—Paper may be stained a beautiful yellow by the tincture of turmeric formed by infusing an ounce or more of the root, powdered, in a pint of spirits of wine. This may be made to give any tint of yellow, from the lightest straw to the full colour, called French yellow, and will be equal in brightness to the best dyed silk. If yellow be wanted of a warmer or redder cast, annatto, or dragon's-blood, must be added. The best manner of using these, and the following tinctures, is to spread them even on the paper, or parchment, by means of a broad brush, in the manner of varnishing.

*Crimson.*—A very fine crimson stain may be given to paper by a tincture of Indian lake, which may be made by infusing the lake some days in spirits of wine, and then pouring off the tincture from the dregs. It may be stained red by red ink. It may also be stained of a scarlet hue by the tincture of dragon's-blood in spirits of wine, but this will not be bright.

*Green.*—Paper or parchment may be stained green, by the solution of verdigris in vinegar, or by the crystals of verdigris dissolved in water.

*Orange.*—Stain the paper or parchment first of a full yellow by means of the tincture of turmeric; then brush it over with a solution of fixed alkaline salt, made by dissolving  $\frac{1}{2}$  oz. of pearl-ash, or salts of tartar, in a quart of water, and filtering the solution.

*Purple.*—Paper or parchment may be stained purple, by archil, or by the tincture of logwood. Brush the work several times with the following logwood decoction:—1 lb. of logwood chips,  $\frac{3}{4}$  lb. of Brazil wood, boiled for  $1\frac{1}{2}$  hour in a gallon of water. When dry, give a coat of pearl-ash solution, 1 dram to a quart, taking care to lay it on evenly. The juice of ripe privet berries expressed will also give a purple dye.

*Staining Parchment.*—*Blue.*—1. Dissolve verdigris in vinegar, and brush over with the solution hot till it becomes a perfect green, then well brush over with a solution of pearl-ash, 2 oz. to the pint, until it becomes a good blue. 2. Use the blue stain for wood, viz. copper filings dissolved in aquafortis; the material must be well brushed over with it, and then brushed over with a hot solution of pearl-ash, same strength as above, until it assumes a perfectly blue colour. 3. Boil 1 lb. of indigo, 2 lbs. of wood, and 3 oz. of alum in a gallon of water; brush well over until thoroughly stained.

*Red.*—1. Boil 1 lb. of Brazil wood and 1 oz. of pearl-ash in a gallon of water, and while hot brush over the work until of a proper colour. Dissolve 2 oz. of alum in a quart of water, and brush this solution over the above before it dries. 2. Use a cold infusion of archil, and brush well over with a pearl-ash solution, 2 drams to the quart.

*Incombustible Paper* may be made by mixing with the pulp a fluid obtained by adding to an aqueous solution containing  $1\frac{1}{2}$  oz. of pure tallow soap, just enough alum to completely decompose the soap. The paper made with this requires no size.

*Bleaching Paper.*—Paper which has been very imperfectly bleached may be rendered thoroughly white by pouring upon it in succession, as dilute solutions,  $3\frac{1}{2}$  parts alum, 1 part chloride of barium, a little free hydrochloric acid, and  $\frac{1}{2}$  part calcined chalk—stirring well during the operation. The fibres of the paper become firmly coated with the brilliant white sulphate of barytes which is formed.

*Pollen Powder, or Paper Powder.*—Boil white paper, or paper cuttings, in water for 5 hours. Pour off the water, pound the pulp in a Wedgwood mortar, and pass through a fine sieve. This powder is employed by the bird stuffers to dust over the legs of some birds, and the bills of others, to give them a powdery appearance; also to communicate the downy bloom to rough-coated artificial fruit, and other purposes of a similar nature; it makes excellent pounce.

**Papier-Mâché.**—Two modes of making articles of papier-mâché are adopted;—either by gluing or pasting different thicknesses of paper together, or by mixing the substance of the paper into a pulp, and pressing it into moulds. 1. The first mode is adopted principally for those articles, such as trays, in which a tolerably plain and flat surface is to be produced. Common millboard, such as forms the covers of books, may give some idea of this sort of manufacture. Sheets of strong paper are glued together, and then so powerfully pressed that the different strata of paper become as one. Slight curvatures may be given to such pasteboard when damp, by the use of presses and moulds. Articles such as snuff-boxes are made by gluing pieces of paper cut to the size of the top, bottom, and sides, one on another, round a frame or mould, which is afterwards removed.

*Polish.*—Articles made of pasteboard have a fine black polish imparted to them in the following manner;—After being done over with a mixture of size and lampblack, they receive a coating of a peculiar varnish. Turpentine is boiled down until it becomes black; and three times as much amber in fine powder is sprinkled upon it, with the addition of spirit or oil of turpentine. When the amber is melted, some sarcocolla and more spirit of turpentine are added, and the whole well stirred. After being strained, this varnish is mixed with ivory-black and applied in a hot room, on the papier-mâché articles, which are then placed in a heated oven. Two or three coatings of the black varnish will produce a durable and glossy surface, impervious to water. 2. Papier-mâché, properly so called, is that which is pressed into moulds in the state of a pulp. This pulp is generally made of cuttings of coarse paper boiled in water, and beaten in a mortar till they assume the consistency of a paste, which is boiled in a solution of gum arabic or of size, to give it tenacity. The moulds are carved in the usual way, and oiled, and a pulp poured into them; a counter-mould

being employed to make the cast nothing more than a crust or shell, as in plaster casts. In some manufactories, instead of using cuttings of made paper, the pulp employed by the paper-maker is, after some further treatment, poured into the moulds to produce papier-mâché ornaments.

*Uses of Papier-mâché.*—It has now, in some cases, superseded the carved and composition ornaments employed to decorate picture and glass frames; but it is in the ceilings and walls of rooms and the interiors of public buildings that papier-mâché is found most valuable. Plaster and composition ornaments are ponderous; carved ornaments are costly; but those of papier-mâché are light and of moderate price. Maps in relief are also occasionally made of papier-mâché. Paper roofs have been occasionally used. Sheets of stout paper are dipped in a mixture of tar and pitch, dried, nailed on in the manner of slates, and then tarred again; this roof is waterproof, but unfortunately very combustible.

*Paper Casts from the Antique.*—This method of obtaining facsimiles of sculpture in basso-relievo is very easy. Still, unsized, common white paper is best adapted for the purpose. It should be well damped; and, when applied to sculpture still retaining its colour, not to injure the latter, care should be taken that the side of the paper placed on the figures be dry—that is, not the side which has been sponged. The paper, when applied to the sculpture, should be evenly patted with a napkin folded rather stiffly; and, if any part of the figures or hieroglyphics be in intaglio or elaborately worked, it is better to press the paper over that part with the finger. Five minutes is quite sufficient time to make a cast of this description; when taken off the wall, it should be laid on the ground or sand to dry.

**COMPOSITION ORNAMENTS FOR PICTURE FRAMES.**—*Making.*—The principal ingredients are glue, water, liuseed oil, rosin, and whiting, which are combined in such proportions as to make a mixture soft enough for working, while,

at the same time, it should be so tough as not to crack, and should harden in a few hours if the ornament be thin, or in a day or two if it be more massive. The state in which it is used by the ornament maker is that of a stiff dough; and the making of it resembles the process by which the baker makes his dough. The proper amount of glue is steeped in water, which is heated to dissolve the glue; while the oil and rosin are melted in a separate vessel, and then poured into the vessel containing the melted glue. The whitening is pounded, and placed in a tub or pan—being previously warmed if the weather be damp and cold—and the hot melted glue, oil, and rosin is poured upon the whitening, and then well mixed up with it, and kneaded, rolled, and beat, until it becomes a smooth, tough, elastic kind of dough or putty. It may then either be used at once, or may be laid aside for future use; but, wherever it is used, it must be warmed, either before a fire or by admitting steam to act upon it, because, when cold, it is too hard and stiff for use.

*Moulding.*—The manner of using this composition is to press it into moulds; the preparation of which is the most important part of the business: it is generally done by men who are not engaged in making the ornaments themselves. The moulds are usually made of boxwood, which, by its smoothness of grain, admits very fine figures to be cut in it, and is very durable. The mould carver has to proceed with his work in an opposite way to the ordinary carver; for he must make depressions or hollows instead of raised projections, and projections instead of hollows. The mould carver makes his mould look, in every part, directly the reverse of what he wishes the ornament to appear.

*Carved Moulds.*—The block of wood being planed and smoothed, the carver draws on its surface a representation of the object which he wishes to carve, and then proceeds to work out the minute details. The tools used in this carving are exceedingly fine and sharp, some of them not exceeding one-twentieth of an inch in width. These are, as in com-

mon carving, mostly gouges, with various degrees of curvature. The sharpening of them is a matter of great nicety, and in some cases requires files made of very fine wire. The block of boxwood is moistened with oil during the process of cutting, in order to facilitate the progress of the tool. The cuts are, in the first instance, made perpendicularly from the surface of the wood, and afterwards varied into the necessary directions to produce the pattern. In order to know how to vary the depth of different parts of the mould, the carver must either be guided by the accuracy of his eye and the correctness of his taste, or he must have another mould of the same pattern before him.

*Cast Moulds.*—Sometimes moulds are made by casting, the material being brass, copper, pewter, lead, or sulphur. A model, representing the object which it is desired to produce, is made of composition or plaster, and is placed on a flat stone, and surrounded by a raised border or edging, so that it lies in a cell or trough. The model is then oiled, and the melted metal or sulphur is poured on it, so as to entirely cover it. When cold, the raised border is broken away, the mould taken up, and the model removed from within it. It is then imbedded in a wooden case to preserve it from injury, and to fit it for the better reception of the composition. Sometimes brass moulds are made in this way, and afterwards chased; that is, the minuter details of ornament are cut, or rather scratched, by very fine tools. When the mould, whether of wood, metal, or sulphur, is to be employed to cast ornaments, it is brushed over with oil, to prevent the adhesion of the composition. A piece of composition, large enough for the intended purpose, is then taken up in a warm soft state, and pressed into the mould by the hand. A wet board is laid upon the surface of the composition, and the whole is put into a powerful screw-press, by which the composition is pressed into every part of the mould, however deep and minute it may be. The same pressure makes the upper surface of the composition