

with the end of a lath in parallel lines from 3 to 4 inches apart. The scorings should be made as deep as possible without laying bare the laths; and the rougher their edges are the better, as the object is to produce a surface to which the next coat will readily attach itself. When the pricked up coat is so dry as not to yield to pressure in the slightest degree, preparations may be made for the floating. Ledges or margins of lime and hair, about 6 or 8 inches in width, and extending across the whole breadth of a ceiling or height of a wall or partition, must be made in the angles or at the borders, and at distances of about 4 feet apart throughout the whole extent; these must be made perfectly straight with one another, and be proved in every way by the application of straight edges; technically these ledges are termed *screeds*. The screeds are gauges for the rest of the work; for when they are ready, and the mortar in them is a little set, the interspaces are filled up flush with them; and a derby float or long straight edge being made to traverse the screeds, all the stuff that projects beyond the line is struck off, and thus the whole is brought to a straight and perfectly even surface. To perfect the work, the screeds on ceilings should be levelled, and on walls and partitions plumbled. When the floating is sufficiently set and nearly dry, it is brushed with a birch broom as before described, and the third coat or set is put on. This for a fine ceiling that is to be whitened or coloured must be of putty; but if it is to be papered, which is very unusual, ordinary fine stuff, with a little hair in it, will be better. Walls and partitions that are to be papered are also of this latter, or of rough stucco, but for paint the set must be bastard stucco trowelled. This coat must be worked of exactly the same thickness throughout, to preserve to the external surface the advantage that has been obtained by floating. For all but the last-mentioned, the set on floated work, the trowel and brush are considered sufficient to produce fine and even work; but trowelled stucco must moreover be hand floated. In this operation the stucco is set with the trowel in the usual manner, and brought to an even surface with that tool to the extent of two or three yards. The workman then takes the hand float in his right hand, and rubs it smartly over the surface, pressing gently to condense the material as much as possible. As he works the float he sprinkles the surface with water from the brush in his left hand, and eventually produces a texture as fine and smooth almost as that of polished marble.

But lathing and plastering on laths as practised in England is at best a very flimsy affair, and greatly requires improvement. Stronger laths than the laths commonly employed, put on further apart, and with headed wrought nails, and the plastering laid on upon both sides in upright work, or both above and below the ceilings at the same time, two men working against one another, will produce work in some degree worthy of the name. The practice of the French in this respect is well worthy the consideration, and to a great extent the imitation, of English plasterers.

The process of plastering on the naked brick or stone wall differs but little, except in name, from that we have described as the mode on lath. The single coat is called rendering, and it need differ only in the quantity of hair, which may be less than is necessary for laying on lath, and in the consistence of the mortar, which may be made more plastic, to work easier, and because in a moister state it will attach itself more firmly to the wall; the wall, however, must itself be well wetted before the rendering is applied. The set is the same, and is put on in the same manner as to two-coat work on lath. For three-coat or floated work, the first or rough rendering should be made to fill up completely whatever crevices there may be in the

work behind it, and be incorporated with it as much as possible. As its name imports, its surface may, indeed, should, be rough; but it is not scratched or lined as the similar coat on lath is. For this, too, the wall must be previously wetted, that the mortar may the better attach itself to it. For the floating, screeds must be formed as before described, and the consecutive process is exactly the same as on lath, both for the floated and for the set coat. In almost every case in which plastering is to be floated, the workman finds a guide for the feet of his wall screeds in the narrow grounds which the joiner has previously fixed for his skirtings; from these he plumbs upwards, and makes his work perfectly flush with them.

Mouldings and cornices (as large combinations of mouldings and flat surfaces immediately under the ceilings of rooms are called) are formed with running moulds, and are generally executed before the setting coat is put on the walls and ceiling. If the cornice do not project more than about an inch and a half, or 2 inches, from the ordinary work, a backing of lime and hair will be sufficient; and if any one part only happen to be more than ordinarily protuberant, a row of nails from 6 to 12 inches apart stuck into the wall or ceiling in the line of that part will give it sufficient support. But if the general mass of the cornice be more than that amounts to, and extend more than 6 or 8 inches along the ceiling, it must be bracketed out, and the bracketing lathed and pricked up, as for ordinary work. This pricking up, or other preparation, must of course be perfectly set before the cornice is run; and there should be one-fourth of an inch at least of clear space between the preparation and the mould in the nearest part. A wooden screed or parallel straight edge is tacked on with brads to the wall, and another on the ceiling, if the cornice be large and heavy, as guides or gauges for the mould, whose rests are chased to fit them; and then one man laying on gauge stuff in an almost fluid state with an angular trowel, another works the mould backwards and forwards over it, which strikes off what is superfluous, and gives the converse of its form to the rest. The mould is never taken down from the work at right angles to the line of it, but is drawn off at the end, so that none of the parts of the moulding or cornice is injured or torn by it, which must otherwise frequently be the case, from the peculiar forms at times given to the details. If a cornice be too large and heavy to be executed at once, it may be done in the same manner at two or more times, in so many parts; and if any part or parts of a moulding or cornice is to be enriched, the space for it is left vacant by the mould, and the enrichment is afterwards supplied. As a cornice cannot be completed up to the angles by the mould, it is worked by hand in those situations to a joint. The joinings are termed mitres, and in forming them the plasterer uses the jointing tools we have already described.

Models for enrichments are made by the modeller, ^{Enrichment} according to the design or drawing submitted to him, and from them the plasterer makes wax or gelatine moulds, or, as in ordinary practice, the modeller supplies the moulds in which the ornament is cast in plaster of Paris. If the ornament be in recurring lengths or parts, as is usually the case, only one length or part is modelled, and casts of as many as are required are taken from the mould; some single ornaments, again, which are very large, require to be moulded and cast in parts, which are put together by means of cement. When the cast ornaments are sufficiently dry the pieces are scraped and trimmed, and the joints made clean and even; and they are set in the cornice with plaster of Paris, with white lead, or with a composition called iron cement, as the case may require. If the castings have something in the cornice to rest upon, the first will do; but if there is nothing to retain or attach them but the

cement, one of the last two must be used. Flowers and other ornaments on ceilings which are too large and heavy to be trusted to adhesive matter alone, must be screwed to wooden cradling behind and above them.

In plastering a wall with common stucco (and its use is mostly for outside work), the first thing to be done is to remove the dust from it by brushing, and then to wet very completely with water. If the wall to be stuccoed be an old one, or one of which the joints have been drawn, the mortar of the joints must be chipped or even raked out, and the bricks picked, to expose a new and porous surface to the plastering before brushing and wetting. The wall is then covered with stucco in a fluid state, applied with a broad and strong hog's bristle brush, like common white-washing. When this is nearly dry the stucco must be laid on as in common rendering, unless the work is to be floated, when the process is nearly similar to that in floated plastering. Screeds must be formed at the highest and lowest extremities of the wall, or of that part of the wall which is in the same vertical line, and is not intercepted by string courses, and be returned at the angles, putting the whole surface into a sort of frame. These must be made perfectly straight and plumb, so as to be quite out of winding by the careful application of the plumb-rule and straight edge. Inner vertical screeds must then follow at three or four feet apart across the whole surface, and be made to range exactly with the outer ones, and then the interstices must be filled in as before. As the work is made good it must be well rubbed with the hand float, as in the execution of trowelled stucco internally, to compress the material, and produce a hard, even, and glossy surface. Preparations for cornices and other projections from the straight surface of the work must have been previously made in or on the brick or stone-work by the protrusion of bricks, tiles, or whatever may be best suited to form a core; and the mouldings and cornices are run with moulds, in the manner described for the same things internally, only that in work of this kind no plastic material but the stucco itself is used,—that is, there is no preparation of any softer material than the stucco itself put under it. In running cornices in this material, workmen are very apt to mix a little plaster of Paris, with the stucco to make it set under the mould, and thus give sharpness and fulness to the mouldings; but this should not be permitted; for the plaster is not qualified to stand the weather as the stucco is, and, if mixed with it, will produce premature decay. When the stucco is perfectly dry, it may be painted in oil colours, or be coloured in distemper; and in either case it is generally (though not invariably) ruled over the surface with a lead point, to give it the appearance of gauged stone-work.

Rendering in the Roman and Portland cements is executed almost exactly in the same manner as stucco rendering is, only that it is laid on the saturated wall directly, without the preliminary operation of roughing in, or washing the surface with a solution of the material. The same process, too, is followed in floating this cement, and with the same exceptions; and as, in addition to its superior hardness and capacity for duration, it is a quick-setting cement, it is far preferable to any of the common stuccoes for running cornices, mouldings, &c. These cements may, like stucco, be painted in oil, or coloured; but instead of a size colour, which is used for almost every other purpose in plastering, the colour for this composition is mixed with diluted sulphuric acid. This too may be lined and tinted to imitate stone and stone-work of any description.

It may not be amiss here to refer to some of the causes of the premature decay which takes place in stuccoes and cements when used externally as a coating to walls. The

primary cause is the presence of muddy earth and decayed animal and vegetable matter in the sand used with the lime and cement. To this may be added frequent impurities in the limes and cements themselves, particularly of argillaceous matter in the former, and sometimes the too great proportions of lime or cement to sand. These things might, however, remain quiescent for a long time, if the work were well protected from access of moisture, which is the grand exciting cause. The paint, or distemper wash, on the surface, is generally sufficient to prevent the rain which may beat against a vertical face from penetrating, especially if the work have been well hand-floated and trowelled, to make it close and compact; but the evil arises from exposure above, and from the numberless horizontal unfloated surfaces which are constantly presented. These receive and collect the water, and convey in streams over the vertical surfaces what is not immediately absorbed; and the work thus becoming saturated, frost seizes and bursts it, or warmth calls the vegetative powers of the impurities in it into action, and the whole is covered with a green sward. Let the sand of which a plaster composition is to be formed, whether with lime or cement, be washed until it no longer discolours clean water, and be well compounded with cementitious matter free from impurities with which it is so frequently charged; let the work be well hand-floated and trowelled, particularly on the backs or upper horizontal surfaces of projections, and protected above by projecting eaves or otherwise; and the work, with common care and attention to paint or distemper at intervals, will last as long as anything of the kind can be expected, or is found, to last anywhere.

A cheap and useful covering for external walls, which are protected by projecting eaves, in plain buildings, is rough cast. This is executed in the following manner:—The surface is first roughed, or indented, and then well brushed with a stiff brush to remove all dust or loose earth. It is then covered with the rough cast, which consists of a small quantity of mortar diluted with water, to which a trowel of pure lime is added to make it about the thickness of cream. After the workman has done all within his reach the scaffolding is lowered, and he proceeds with the remainder. Another process is somewhat dearer. After having been roughed or indented, the wall is sprinkled with water, and then rendered with lime and hair; and when that is set, another coat of the same material is superadded, laid as evenly as it can be without floating, and as soon as a piece of two or three yards in extent is executed, the workman lays on it an almost fluid mixture of clean fine gravel and strong lime, which have been well mixed together. This is immediately washed with any ochreous colour that may be desired, and the whole dries into one compact mass. A third process, called stuccoing, is performed by the workman laying on a few trowels of stucco, which he spreads as much as possible; a second workman provided with a brush and a small wood float follows him, and after sprinkling the mortar with water he rubs over that part he has wetted with the float, and at the same time it may be whitened with lime alone. When the lime is very good this makes very good work.

In renovating and repairing plastering the whole surface is first well washed to remove the dirt which may have attached itself, and as much of the earthy matter of the previous coat of whitening or colouring as will come away; any injuries the work may have received, such as cracks and fractures, are then repaired; and when the new stuff is quite dry, the joinings are scraped to produce an even surface, and the whole is again whitened or coloured once or twice or oftener as may be required, to make it bear out well. Stuccoed walls which have been painted must

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be well rubbed with pumice stone, to take off the old paint as much as possible before the new work is proceeded with.

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plastering. For a decoration to rooms having plastered walls, instead of papering or flat painting, or for a suitable ornamentation for the interior of churches built at small outlay, the old system of pargetting has been revived. The usual stucco or other plaster finish is, while still wet, stamped over with a pattern made of brass, or for rougher work of wood, to any geometrical or other form in accordance with the style of architecture; this indents the surface. It may be left all of one colour, or the open portions of the device may be filled in with another coloured plaster.

Another revived method, especially for outside work, now much in use is called sgraffito. It was in vogue with the Italian artists about two centuries since, who executed some very elaborate specimens of ornamentation with it. The process is briefly as follows:—First, mix with the mortar some colouring substance of the tint desired for the pattern of the design; then apply a thin coat of it to the wall. When this coat is nearly dry, apply on it another coat similarly prepared but of the colour intended for the grounding, and then, a mould having been prepared in zinc of the exact outline of the pattern, it is to be applied to the surface, its outer edge marked round, and with a sharp tool as much of the upper coat of plaster is cut away as comes within the pattern, down to the face of the lower coat. By a careful arrangement of pattern, a considerable variety of colouring may be employed; and even three coloured coats can be put on, cutting through sometimes one, sometimes two, as may be desired to represent the design. As the colour is in the material itself, there is no fear of its scaling and so presenting a bad appearance; and it is a comparatively cheap process for the decoration of a new surface which cannot be painted for some time. The process has been adopted in England with coloured cements for outside work.

Under the plasterer's trade it may be desirable to mention some of the varieties of artificial marbles, scagliola, and other similar work for the decoration of buildings. Scagliola is a species of plaster or stucco invented about 1600–50 in Italy. The work is lathed and plastered as usual, and then the artist commences, preparing his material, which is composed of the purest gypsum broken into small pieces and calcined, passed through a very fine sieve and mixed up with glue, isinglass, &c. In this solution the colours are diffused that are required to be imitated in the marble; or the colours are prepared separately, and afterwards mingled and combined nearly in the same manner that a painter mixes the primitive colours on his palette to compose his different tints. When the gypsum is prepared and mingled, it is laid on the plaster, and then floated with proper moulds of wood, the artists during the floating using the colours necessary for the imitation, by which means they become mingled and incorporated with the surface. The process of polishing follows, first by means of pumice stone, then with tripoli and charcoal and fine and soft linen; after this the surface is rubbed with a piece of felt dipped in a mixture of oil and tripoli, and last of all with pure oil. The imitation may be so good that except by fracture or by sound it cannot be discovered to be a counterfeit.

Marazzo marble is made of cement mixed with fibre for strength and to resist a blow. Slabs are bedded on plaster of Paris, and with cramps and dowels like marble. Every variety of marble can be imitated in it, and it receives a high and permanent polish. The Marbre Universel Company have put forward a new manufacture of a similar description.

MODELLING, CARVED WORK, AND GILDING.

The modeller copies the drawings of the designs which Modelling may have been prepared for the enrichments, in whatever material they are to be cast, whether in plaster, in metals, or in composition of any kind, for the plasterer, smith, or decorator. The model is made of soft wood, by the usual chisels and gouges, or in a finely-tempered and plastic clay called modelling clay, or in wax. The modeller works the clay with his fingers, assisted by a few ivory, bone, or steel tools for finishing off neatly and sharply, and for working in parts which he cannot reach with his fingers. The best workman is one who can do most towards producing the required forms with his fingers, unassisted by artificial tools, as a greater degree of ease and freedom almost always results from the use of the hands alone. The model being completed, it is moulded, that is, a mould or moulds are made from it of a preparation of resin or of gelatine, sometimes of plaster of Paris; the moulds, if they have to be formed in portions, are fitted exactly to each other at the edges, and in these moulds casts in plaster of Paris or other material are made to any extent that may be required. For smith's work the wood model is sent to the founder for casting in metal. For carved work, such as caps of columns, shields, medallions, consoles, &c., the model may be sent to the mason or stone carver for the completion of the block, which may have been left in a boasted state by the mason when setting it.

The modeller having some pretensions to be considered an artist rather than a mere artificer, is for the most part paid according to his merits, rather than for so much time, according to the ordinary mode of determining the value of artificers' works.

The carver is strictly an independent artist, whose business it is to cut ornaments and enrichments in solid and durable material, such as stone and wood, so that, like the modeller, he must be paid according to the taste and power he may exhibit in his works, rather than as a common artificer. The art of carving has, however, been in a great measure superseded by modelling and casting. In works of a free style, or of a mediæval character, the carver is often left free to exercise his own taste and fancy or talents in the execution, with or without a sketch by the architect before him. The decorator, in addition to casts in plaster of Paris, now makes use of composition ornaments, which are formed of a mixture of whitening and glue pressed into moulds; or of papier mâché, which is paper pressed into moulds; or of a composition of a thin coat of plaster of Paris poured into the mould, and then covered with coarse canvas, the result being to all appearance a plaster cast, but it is far lighter in weight,—a figure the size of life being readily moved about by one person. It was an old process revived by the late Mr Owen Jones, and well carried out for him by M. Desachy, in the elaborate ornamented ceiling at St James's Hall, Piccadilly.

Gilding is applied to castings as well as to carvings; but the former being, almost as a matter of course, less sharp and spirited in their flexures and details, as well as less firm in substance than the latter, castings can less bear to be further subdued by the application of foreign matters to their surfaces than carvings may. Gilding is the application of gold leaf to surfaces, which require, however, to be previously prepared for its reception. The work is first primed with a solution of boiled linseed oil and carbonate of lead, and then covered with a fine glutinous composition called gold size, on which, when it is nearly dry, the gold leaf is laid in narrow slips with a fine brush, and pressed down with a piece of cotton wool held in the fingers. As the slips must be made to overlap each other slightly, to insure the complete covering of the whole surface, the loose

edges will remain unattached; these are readily struck off with a large sable or camel-hair brush, fitted for the purpose; and the joints, if the work be dexterously executed, will be invisible. This is called oil gilding, and it is by far the best fitted for the enrichment of surfaces in architecture, because it is durable, and is easily cleaned, and does not destroy or derange the forms under it so much as burnished gilding does. The latter requires the work to be covered with various laminæ of gluten, plaster, and bole, which last is mixed with gold size, to secure the adhesion of the leaf.

GLAZING.

The business of the glazier, the manufacture of whose material has of late years improved and progressed in a very remarkable degree, may be confined to the mere fitting and setting of glass; even the cutting of the plates up into squares being generally an independent art, requiring a degree of tact and judgment not necessarily possessed by the building artificer.

Tools. The glazier is supplied with a diamond or other cutting tool, laths or straight-edges of various lengths, a square, a glazing-knife, a hacking knife, a hammer, a duster, a sash-tool, a two-foot rule, and a machine called a glazier's horse, which he fixes outside a window sill, and stands on to reach the upper panes for glazing or cleaning purposes, without removing the sash, and so injuring the beads and paint.

Materials. His materials are simply glass, putty, and priming or paint. The glass is supplied by the glass-cutter, of the qualities and sizes required for the particular work to be executed. The putty is made by the glazier himself, or by a labourer, of fine clean powdered chalk or whitening, well mixed and combined with linseed oil, and kneaded to the consistence of dough. No more putty should be made at once than is likely to be worked up in the course of a few days, as, the oil drying out, it becomes hard and partially set, and is therefore less available for its purposes. Priming is a thin solution of white (with a little red) lead, mixed in linseed oil. For ordinary glass, the sashes are sent to the glazier from the joiner, after having been fitted into their places, and only require to be glazed before they are permanently set or hung. Supposing that no preliminary process is required, such as stopping (the result of bad joiners' work) and knotting (and knotty stuff should not be admitted in sashes), the sashes require to be primed. The priming is laid on every part of the sash except the outer edges of the styles and of the bottom and top rails, with the sash tool or painting brush, that is, if the sashes are intended to be painted; for if not, the rebates only must be primed. The object of this is to prepare the material of which the sash is composed for the reception of the putty, which would not otherwise attach itself so firmly as it does after this preparation. The priming being sufficiently dry, the workman cuts the panes of glass down into their places, making every one fall readily into the rebates without binding in any part; indeed the glass should fit so nicely as not to touch the wood with its edges anywhere, and yet hardly allow a fine point to pass between it and the sash-bar or rebate, the object being to encase it completely in putty, and yet that the putty should not be in greater quantity than is absolutely necessary. The glass being fitted or cut down, the workman takes the glazing-knife in his right hand, and a lump of putty in the palm of his left, the sash being laid on its face, that is, with the rebates upward, before him; with the knife he lays a complete bedding of putty on the returning narrow stops of the rebates, all round to every pane. This being done, the panes of glass are put on it as they have been fitted, and every one is carefully rubbed down with the

Glazing
operations.

fingers, forcing the putty out below and round the edges of the glass, until they are nearly brought into contact with the wood or other material of the sash. The rebates are then filled in with putty behind, the mass forming exactly a right-angled triangle, its base being the extent of the stop of the rebate, and its perpendicular the depth from the glass to the outer edge of the rebate; and the third side or hypotenuse is neatly smoothed off. The sash being then turned on its edge and held upright by the left hand, the protruded putty of the bedding, or back putty as it is called, is struck off with the knife, and the section of it neatly drawn. The sashes are now deposited on their faces to allow the putty to set, and then they may be hung and painted.

To very large squares, and to plate glass, needle points, or small nails called sprigs, are used to retain the material securely in its place while the putty is soft and yielding. These have to be carefully inserted, for if they fix the glass it is apt to fly at any sudden vibration. Large squares and plate glass are usually inserted after the sashes are hung, to prevent risks of breakage. Where the bar and frame can be made to allow of it, large squares are secured in their place by wood beads screwed to the rebate in lieu of putty. In this case the edge of the glass is first covered with a piece of flannel, or thin india-rubber, to fill up crevices, and so prevent admission of dust, and stop any current of air.

Lead-work, as it is termed, is the glazing of frames rather than of sashes with small squares or quarries of glass, which are held together by reticulations of lead; and these are secured to stout metal bars, which are fixed to the window frames. Leaden reticulating bars are grooved on their edges to receive the quarries, and are tied by means of leaden ribands or wires to the saddle bars, which, in their turn, are affixed to the stouter bars before mentioned, if the bay or frame be so large as to require both. This is now extensively carried on in the painted glass window shops, where the glass is cut to patterns, and shows outlines of figures, costumes, &c. "Stained glass" is obtained by mixing colours in the pot while in the furnace, hence the term "pot metal" for it. A kind of coloured glass has only a skin of colour on one side of the white material, and hence is termed "flashed glass."

Besides all the varieties of clear glass, the glazier has now at his command the many qualities of obscured glass, beyond the ground and painted glass of former days; the lace-pattern glass, executed by laying a pattern on the material which has been covered with a varnish, placing it in a box filled with a fine powder, which when shaken adheres to the varnished portions, and then putting it in a kiln where it becomes fixed; the patent rough plate for conservatories, workshops, &c., and its fluted varieties; the rough cast plate for workshops and store-houses; the stained ornamented quarry for church windows &c. Lastly, there is the engraving on glass by aid of the sand blast,—a new and easily managed method, consisting in a jet of air blown violently through a tube, carrying with it particles of fine sand. The action is very rapid, and it reduces the surface in a few minutes to the condition of ground glass. A piece of lace, however, is sufficient to arrest the action of the sand. Reece's patent embossed and coloured glass is useful for screens and for windows which are not meant to be looked through.

Coming within the scope of the glazier's business is the novel pavement light, consisting of a frame of iron cast with small many-sided apertures, into which are placed a series of dome-shaped or prism-shaped blocks of glass, reflecting the light falling upon them. They distribute the light to a greater extent than a piece of rough plate-glass, and like Chappuis's and other reflectors require to be kept clean. Moore's window ventilator allows of the