

admission of air through its louvres, which are worked by a wire or cord as necessary. Hartley's patent perforated glass attempts to gain the same end by small slits formed in the pane.

For publications relating to the glazier's chief material, see the article GLASS. For patterns of lead-work, see Shaw's reprint of W. Lidde, *Books of Sundry Draughts*, 8vo, 1615.

SMITH-WORK AND GASFITTING.

The smith is the worker in wrought metals of all kinds required chiefly by the carpenter and joiner, who fixes them in the building. Smithery is the art of uniting several lumps of iron into one lump or more, and forging them to any desired shape. The earlier parts are done at the forge and on the anvil with the hammer, and hence is produced "wrought work," whether for useful or for ornamental purposes. Machinery has been brought extensively to the smith's assistance, for rolling, drilling, planing, &c. The ornamental portion of his work is wrought iron shaped by hand into devices and patterns according to the various styles of architecture, as in gates, railings, standards, hinge bands, locks, handles, knockers, lanterns, candlesticks, and other lighting contrivances, which are also executed in brass-work and in cast-iron.

founder's work.

The founder's work is all cast metal, such as for ornamental gates and railings, rain-water pipes, cistern heads, and other portions, guttering, stable-fittings, coal-plates, &c. These commonly require to be fitted and fixed by the smith. The founder supplies all fire-grates, stoves, and other apparatus for warming and also for ventilation.

Gasfitting.

The gasfitter is a smith who supplies and fixes cast-iron pipes for diameters above two inches, and wrought iron for those of smaller bore, where gas is required to be used. A three-quarter inch pipe is considered by some as the least size to be used even for supplying rooms on an upper story; tin or composition metal pipes are fixed for sizes under half an inch, and also flexible tubes. It is recommended that no pipes should be embedded in the plastering, as is usually the case. In Paris the gas pipes must be seen for their whole length, and where passing through a floor or partition they must be let through a larger pipe having both ends open. Lights should not be fixed within 36 inches beneath wood-work. The solar or sun light is one of the modern additions for lighting large halls, as well as for dwelling-rooms; the globe lights, and some others of the same kind, all assist also in ventilating the apartments by tubes carrying off the products of combustion, which tubes are ordinarily fixed in the thickness of the floor; and as the air therein is raised to a very high temperature, great precautions are required to prevent danger by fire to the timbers, and also where the tubes pass through the roof. The effect of continued hot air on wood is little understood by the public generally. The star light, an invention of the late Mr Owen Jones, consists of a number of jets placed either horizontally or slightly inclining upwards at the jets; this is productive of a pleasing and brilliant light. There are many varieties of gas burners, such as the one called a fish tail, from which the form of the flame is the worst as regards economical results; the bat's-wing is better, and the argand is the best. The latter is a metal ring, pierced with numerous small holes, which divide the flame and allow of the proper combustion of the gas. Besides the common metal burners, there are some made with a soapstone or other cap, to prevent corrosion; and one of the better class is Bronner's patent burner, into which the gas is admitted through a very small opening adapted for supplying only a certain quantity of gas per hour. The usual burners have a

large opening up to where the gas is consumed, and hence a waste of it.

For publications relating to the smith and founder's trade, see the article IRON; also Brandon, *Analysis of Gothic Architecture*, 4to, 1847; Viollet-le-Duc, *Dict. Rais.*, s.v. Grille and Serrurerie; Wyatt, *Metal Work*, fol., 1852; Jousse, *La fidele ouverture de l'art du Serrurerie*, fol., 1627; *L'Art du Serrurerie*, in *Description des arts et metiers*, fol., 1767; Fordrin, *Livre du Serrurerie*, fol., 1723; Cottingham, *Smith, Founder's, &c., Director*, 4to, 1823; Pugin, *Designs for Iron and Brass Work*, 4to, 1835; Shaw, *Examples of Ornamental Metal-Work*, 4to, 1825; Welldon, *The Smith's Right Hand*, 8vo, 1765; Leconte, *Choix de nouveaux modèles de Serrurerie*, fol., 1838; Scott, *Ornamental Designs*, fol., 1852; King, *Orfèverie et ouvrages au moyen age*, fol., 1853-60; Tijou, *A New Booke of Drawings*, fol., 1693; Bordeaux, *Serrurerie du moyen age*, 4to, 1858; Bury et Hoyau, *Modèles de Serrurerie*, fol., 1826; Thielle, *Modèles, &c.*, fol., no date; Lachave, *Balcons, &c.*, fol., 1864; Normand, *Œuvres, &c.*, fol., 1824.

HOUSE-PAINTING.

The real object of painting is to protect wood, metals, and stuccoes from the action of the atmosphere, by covering them with a material which is capable of resisting it. A continued succession of moisture and dryness, and of heat and frost, soon effects the decomposition of woods, causes oxidation in most of the metals used for economic purposes, and destroys the generality of stuccoes if their surfaces be exposed nakedly to it. A solution of ceruse or white lead in linseed oil spread over them prevents these injuries in a great measure, and for a considerable period of time; and as the application of such an unction can be repeated without much trouble or expense as often as occasion may require, it may be said to furnish a protection against the contingencies named. In addition to the utility of painting, it is also available as an ornament, by bringing disagreeably or diversely coloured surfaces to a pleasing and uniform tint, or by diversifying a disagreeable monotony of tint, to suit the taste and fancy; and this is done in a great measure by the addition of various pigments to the solution before mentioned.

The painter works with brushes of various sizes, made of hog's bristles, or of hair with a mixture of bristles, and pencils made of badger's hair; these, with the addition of pots to hold his colours, a grinding-stone and grinder or muller for grinding or triturating them, a pallet and a pallet knife, dusting brushes and a scraping knife for cleaning iron-work before repainting, are almost his only implements. In painting the outside of windows he sometimes uses the glazier's horse. His materials are comparatively few also; but for some purposes these require a great variety of ingredients, the preparation and combination of which, however, now devolves principally on the manufacturer or colourman, and not on the painter himself. The colours are ground with a muller, which is worked on the stone until they become a very fine powder; with some, the more they are ground the better is the colour. The powder is moistened with a little water or oil, as necessary, from time to time. They should all be ground separately; it is not good to produce a tint by mixture until they are well prepared. Only the quantities necessary for the work undertaken should be got ready. Common colours are those which are produced by the addition to white lead (or zinc white) and oil of lamp-black, red lead, or any of the common ochres; blues, greens, rich reds, pinks, and yellows, &c., being more costly, are taken as such. Unflatted white is a common colour; flatted it classes with the rich colours. If the same surface be painted of two different tints, it is said to be in party colours. The substance generally constituting nine-tenths of the body of paint is carbonate of lead, commonly called white lead, the quality of which is therefore of the greatest importance

to the durability of the work. It is said to improve by being kept for several years before use. Three qualities are manufactured, and there are six or more chief modes of adulteration recorded, which accounts in some measure for the great difference in painters' prices, and the relative values of their work when done. The other metallic white paint occasionally used, especially in water colour painting, is zinc white. It is well known for its intense whiteness, its resistance to sulphurous and other deteriorating causes, and its harmless qualities to the workman and the inmates of the house under decoration. Zinc white possesses less body than white lead, and great care is requisite that the colour when ground in oil is of sufficient consistence to be laid on a flat surface without showing through; any oil in excess will form a slight glutinous coating on the surface, retaining every particle of dust brought in contact with it, until it has evaporated. In general this white does not dry so quickly as the other colour, but this defect is remedied by the application of proper drying oils. It is asserted that in consequence of the great durability of the colour, the paint may be washed for a succession of three, four, and even five years; and that after each successive washing the surface will be found as clear and bright as when fresh painted.

Painting wood-work.

In painting or laying on the colour, the brush must be constantly at right angles to the face of the work, only the ends of the hairs, in fact, touching it, for in this manner the paint is at the same time forced into the pores of the wood and distributed equally over the surface. If the brush be held obliquely to the work, it will leave the paint in thick masses wherever it is first applied after being dipped for a fresh supply into the pot, and the surface will be daubed, but not painted. Painting, when properly executed, will not present a shining, smooth, and glossy appearance, as if it formed a film or skin, but will show a fine and regular grain, as if the surface were natural, or had received a mere stain without destroying the original texture. Imitative grainings, however, and the varnishes which are intended to protect them, and make them bear out, necessarily produce a new and artificial texture; and for this reason some consider them to a greater or less extent disagreeable, however well the imitations may be effected. Carved mouldings and other enrichments have to be picked out with a pencil or small brush, that the quirks, &c., be not choked up.

As it must be presumed that all the wood submitted to the operations of a painter, which has passed through the hands of the joiner, is already well seasoned and properly dry, it is only necessary to say generally, that the work should be free from moisture of any and every kind before paint is applied to it, or it will at the least prove useless, and probably injurious rather than beneficial. This remark applies alike to wood and to plastered work, both internal and external; that is, whether they be subjected to the more violent changes of the weather or not. Dampness or moisture in woods, stopped in or covered up with paint, will, under ordinary circumstances, tend to their destruction; and in stuccoes it will spoil the paint, and most probably injure the plastering itself also. The first thing the workman has to attend to in painting new wood-work is to prepare its surface for the reception of paint, by counteracting the effect of anything that may tend to prevent it from becoming identified with the material. Thus, in painting pine-woods, the resin in the knots which appear on the surface must be neutralized, or a blemish will appear in the finished work over every resinous part. In best work the knots should be cut out to a slight depth at the bench, and the holes filled up with a stiff putty made of white lead, japan, and turpentine. The next best way is to cover them with

gold or silver leaf. The usual method is to cover them with a size knotting, which is a preparation of red lead, white lead, and whitening made into a thin paste with size. The common coating of red ochre is worth nothing. The next process is that of priming, which consists in giving a coat of white lead with red lead and a little drier in linseed oil. This is the first coat, upon which the look of the finished work much depends. Inequalities or unevennesses of surface must be reduced with sand-paper or pumice-stone, or made up with putty. The necessary process for killing knots will generally leave a film, which must be rubbed down; and the heads of nails and brads having been punched in, will present indentations, which should be stopped, as well as any cracks or other imperfections, with putty. A second coat is then given, consisting of white lead and linseed oil. It should have a good body, and be laid even. This coat, when thoroughly dry, is in best work rubbed down with fine sand paper and carefully examined to ascertain if any further stopping be required; and then the third coat or ground colour is applied, of a somewhat darker tint than wanted when finished, having sufficient oil for easy working, but not too fluid,—about two-thirds oil and one-third turpentine are used. The flattening coat follows, the object of which is to do away with the gloss or glaze of the oil, by obtaining a flat appearance. White lead is mixed with turpentine, with sometimes a little copal varnish; the colouring matter is added, but always lighter than the ground colour, or it would when finished appear in a series of shades and stripes. Flattening must be executed quickly, on account of the evaporation of the turpentine, and the brush is generally, if not always, carried up the wall and not across it. Some painters use a large quantity of turpentine in the several coats for quick work, as it dries more rapidly; but for good and lasting work no turpentine should be used. Flatted work is generally done only to best apartments, chief staircases, entrance halls, &c., and omitted in the upper rooms, in bedrooms, and in basements. All new wood-work should be painted a sufficient number of coats to "bear out" as it is called; this is a precaution against each coat being so much diluted with turpentine or other fluid as not to cover sufficiently, which is seen by a deadness in one part and a glaze in another. The priming coat and three others should be sufficient. Sometimes plaster and new wood are first done over with clearcole, which is white lead ground up in water and size added. This prevents absorption of the oil, but the paint added subsequently is apt to blister or to crack off: it therefore should not be allowed.

Plaster and stucco to be painted requires some care in the workmanship of it, as noticed under "Plaster-work," *supra*, to prevent bubbles, and must be quite dry. Some persons recommend a priming or a second coat of strong double size; the next coat then consists of white lead in oil as stiff as possible, and then another coat of size, and so on; but such work should be repudiated. A good first coat of priming, as much as the stucco will absorb, is essential.

All new outside work should be primed with red lead or litharge, mixed in linseed oil; the second coat is of the same mixture if four-coat work is to be done, and in this coat all defects are to be made good; the third and fourth coats, as may be determined upon, are generally of the tint required.

In painting old work, where two coats are generally considered sufficient, the surface must be well washed to get rid of all dirt and grease, and then rubbed down with pumice-stone to remove all inequalities. The work then receives one coat, after which any holes are stopped by the painter with putty; the second and perhaps a third

coat, or a flattening coat, are then applied. Sometimes each of the earlier coats is rubbed down.

Old ceilings and soffits of stairs are either washed to clean off the dirt and grease, stopped (which is cutting out the cracks and stopping them with new plaster), and whitened by a coat of whitening or Spanish white mixed with size; or after the two first operations they are finished in distemper, which is white lead and size; it presents a better appearance. Colouring is also done to plastered walls, the white being mixed in half linseed oil and half turpentine, and some earth added to make the tint required. Limewhiting is done by the bricklayer's labourer. Stucco or plaster-work, which is intended to be painted, but which is not sufficiently dry to receive the oil, may have a coating of water colours, or distemper colour, as it is called, in order to give a more finished appearance to that part of the building. The colour selected should be ground very fine, and incorporated with the whitening and parchment, or other strong size. Two coats will be required to make it bear out uniformly. When the stucco is sufficiently dry, and it is desired to be painted, the whole of the above colouring has to be washed off, and the painting proceeded with as described for new work.

Metal painting. Metal-work, not being absorbent, only requires when new to have a priming, and one, two, or three coats of oil paints, as may be considered necessary. It should have a coat as soon after it leaves the founder or smith as possible, to prevent early stages of oxidation. Old work should be cleaned, scraped, and filed if necessary, to remove rust, broken paint, and dirt.

Graining. Graining is understood among painters to be the imitating of the several different species of ornamental woods, as satin-wood, rose-wood, king-wood, air-wood, mahogany, wainscot or oak, and others. After the necessary coats of paint have been put on to the wood, a ground is then laid of Naples yellow and ceruse, diluted with turpentine if for satin-wood, which is left to dry. The painter then prepares small quantities of the same yellow and ochre with a little brown, and boiled oil and turpentine, and having mixed this, spreads it over some small part of his work. The flat hog's hair brushes being dipped in the liquid and drawn down the newly laid colour, the shades and grainings are produced. To obtain the mottled appearance, the camel's hair pencils are applied, and when completed the work is left to dry, and afterwards covered by a coat or two of good copal varnish. Imitation wainscot requires the use of combs of various degrees of fineness to obtain the grain (whence the process is called *combing* by some persons), and the flower is got by wiping off the colour with a piece of rag. When dry it is over-grained to obtain a more complete representation of the natural wood, and then varnished. If the work be done in water colour and not in oil, beer grounds to act as a drier are mixed with the colour; this sets it ready for varnishing. A "patent graining-machine," a sort of roller with a pattern upon it, has lately been introduced. The writer of this article suggested some years ago that deal well sized to prevent absorption might be at once grained either wainscot or pollard oak, without the preliminary operation, delay, and smell of painting. When dry it is to be varnished as usual. The effect is somewhat better than that obtained by the usual method of graining.

Marbling is the imitation of real marbles, granites, &c., some of which are represented by splashing on the carefully prepared ground, which should have been painted and often rubbed and polished to obtain an even surface; others have to be painted in colours, and then well varnished. The most expert at this sort of imitation do their work so as to prevent its easy detection except by the touch.

Ornamental painting embraces the execution of friezes and the decorative parts of architecture on walls and ceilings in chiaroscuro (or light and shade) or monochrome colouring. The ground is well prepared, and of the tint of the proposed work; the ornament and figures are drawn upon it, and are then painted and shaded to give them their due effect. This kind of work is sometimes painted on cloth and then fastened up. When the ornamental work is of a similar pattern throughout, as mouldings, fretwork, a running ornament, &c., it is effected by stencilling. This method consists in drawing a certain length of the pattern on paper, which is pricked through with a large sized needle, then laid on the wall to be ornamented, and struck with a small linen bag containing powdered chalk; the chalk enters the apertures, and fixes itself against the paint. The painter then draws it, or fills in the pattern with colours. Another method is to cut out the pattern where possible, and the paper, being stiffened with size, is laid on the surface, and a brush filled with the colour passed over it; the paper is carefully removed and laid on a fresh place, and so on. The pattern may then be touched up when dry with another tint, or with gold, or another pattern with minutest detail laid on it, and the operation repeated. A wall surface may be covered with such an ornamentation, of which paper hangings are a cheap substitute.

Many of these methods of decoration having been styled shams, the promoters of real woods advocated the disuse of paints, &c. This has led to the increased use of deals and pines for inside doors, wainscots, linings, shutters, and the like, which, if not left as completed by the tradesmen, are sized and varnished or polished. But in such a case a good selection of the wood is necessary, and it has to be picked. Another method is to stain the timber, as of roofs, galleries, and the like, or the joiners' work, so that it represents various tints of oak, and this is protected by a coat or two of varnish. These systems are open to the objection that the varnish, especially in towns, darkens rapidly, and every coat of it adds to the defect, so that in a few years paint is required to give the work the clean and lively appearance the wood originally possessed. Real wainscot, mahogany, and other woods are usually polished; the first is sometimes varnished after being properly prepared to prevent the rise of the grain which occurs when it is touched by a liquid.

Varnishing having been frequently referred to, we must notice that there are many varieties useful for various purposes. Like white lead, oil, and turpentine, they are subject to much adulteration, whereby the work is deprived of its proper consistency, and the painter and his employer dissatisfied with the result. There are drying varnishes made with spirit of wine; these are applied to some furniture, mouldings, &c. Varnishes made with essential oils, especially those made with oil of turpentine or ether and pure copal, are very solid, and better than those made with fat drying oils, which, from their colour being dark, are used only with grounds of a dark colour. Varnish can sometimes be tinted to correct defects of colour in graining, &c. For wood-work copal varnish in oil should alone be used.

It is not within our province to enter upon the higher class of painting on walls, which comes under the trade of the decorator, including that of the gilder and the artistic draughtsman and colourist, nor upon the higher class of paper-hangings. Decorations must necessarily depend upon the taste and skill required or employed in producing them. Paper-hangings are paid for by the piece or yard, Wall-papers a piece being made in England twelve yards long and twenty inches wide, and the hanging is charged at so much the piece. A dozen of borders is twelve yards long; they are charged by the yard for the material, and by the dozen for hanging. Sizing and otherwise preparing the

Ornamental painting.

walls may be requisite before hanging the papers; and washing old papers from off the walls should always be insisted upon by the owner of a house, as accumulations of paste, colours, and size are apt to breed vermin, and, as some think, to give rise to fevers. French paper-hangings are only eighteen inches wide and nine yards long. Wood-linings, old panelled wainscoting, and other irregular surfaces, require to be canvased and papered before the decorative paper is hung, otherwise it is liable to crack with the shrinking of the wood.

The principal publications on house painting are as follows:—Tingry, *Painter's and Varnisher's Guide*, 8vo, 1832, 3d edit.; Higgins, *Painter's and Decorator's Companion*, 4to, 1841; Arrow-smith, *House Decorator's and Painter's Guide*, 4to, 1840; Field, *Руководств of the Painter's Art*, 12mo, 1850, and his *Chromatography*, 4to, 1841; Smith, *The Art of House Painting*, 12mo, 1687, improved by W. Butcher, 8vo, 1821; Whittock, *Decorative Painter's Guide*, 4to, 1841; Moxon, *Grainer's Guide*, 1842; Barber, *Painter's Assistant*, 12mo, 1852; *Wood and Marble Imitator's Manual*, 8vo, Edinb. There are two or three French journals which give examples of imitations of woods and marbles, and illustrations of decorations for apartments. (W. P.)

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Legal definition. BUILDING SOCIETIES, or societies "for the purpose of raising, by the subscriptions of the members, a stock or fund for making advances to members out of the funds of the society upon freehold, copyhold, or leasehold estate by way of mortgage," may be "either terminating or permanent" (37 and 38 Vict. c. 42, § 13).

A "terminating" society is one "which by its rules is to terminate at a fixed date, or when a result specified in its rules is attained," a "permanent" society is one "which has not by its rules any such fixed date or specified result, at which it shall terminate" (§ 5).

Popular definition. A more popular description of these societies would be,—Societies by means of which every man may become "his own landlord," their main purpose being to collect together the small periodical subscriptions of a number of members, until each in his turn has been able to receive a sum sufficient to aid him materially in buying his dwelling-house.

Origin. The origin and early history of these societies is not very clearly traceable. A mention of "building clubs" in Birmingham occurs in 1795; one is known to have been established by deed in the year 1809 at Greenwich; another is said to have been founded in 1825, under the auspices of the earl of Selkirk at Kirkcubright in Scotland, and we learn (Scratchley *On Building Societies*, p. 5) that similar societies in that kingdom adopted the title of "menages."

When the Friendly Societies Act of 1834 gave effect to the wise and liberal policy of extending its benefits to societies for frugal investment, and generally to all associations having a similar legal object, several building societies were certified under it,—so many, indeed, that in 1836 a short Act was passed (6 and 7 Will. IV. cap. 32), confirming to them the privileges granted by the Friendly Societies Act, and according to them the additional privileges (very valuable at that time) of exemption from the usury laws,

simplicity in forms of conveyance, power to reconvey by a mere endorsement under the hands of the trustees for the time being, and exemption from stamp duty. This Act remained unaltered till 1874.

The early societies were all "terminating,"—consisting of a limited number of members, and coming to an end as soon as every member had received the amount agreed upon as the value of his shares.

Take, as a simple typical example of the working of such a society, one the shares of which are £120 each, realizable by subscriptions of 10s. a month during 14 years. Fourteen years happens to be nearly the time in which, at 5 per cent. compound interest, a sum of money becomes doubled. Hence the present value, at the commencement of the society, of the £120 to be realized at its conclusion, or (what is the same thing) of the subscriptions of 10s. a month by which that £120 is to be raised, is £60. If such a society had issued 120 shares, the aggregate subscriptions for the first month of its existence would amount to exactly the sum required to pay one member the present value of one share. One member would accordingly receive a sum down of £60, and in order to protect the other members from loss, would execute a mortgage of his dwelling-house for ensuring the payment of the future subscription of 10s. per month until every member had in like manner obtained an advance upon his shares, or accumulated the £120 per share.

As £60 is not of itself enough to buy a house, even of the most modest kind, every member desirous of using the society for its original purpose of obtaining a dwelling-house by its means would require to take more than one share. In this respect the Act of 1836 presented a curious inconsistency; it limited the amount of each share to £150, and the amount of the monthly contributions on each share to £1, but did not limit the number of shares a member might hold. If its purpose in this respect was to confine the operation of these societies to the industrial classes, it was defective. The only rational explanation of the provision is that it was an anticipation of the modern system of limited liability.

The earlier formed societies (in London at least) did not usually adopt the title "Building Society," or they added to it some further descriptive title, as "Accumulating Fund," "Savings' Fund," or "Investment Association." Several are described as "Societies for obtaining freehold property,"