

with grey and black patches and veins); *Victoria Red* (from Cork, mottled light red with thin dark veins).

Many foreign marbles are imported and used for decorative purposes in this country, and the following are some of these:—

**BELGIAN:** *Belgian Black* (deep black); *Belgian Fossil* or *Petit Granite* (very dark grey with lighter grey spots—fossils—and veins); *Blue Belge* (black or deep blue-black ground with white, light grey or bluish-grey streaks); *Rouge* (various, light reddish-brown ground with white, grey or dark brown irregular veins); *St Anne* (dark grey with white cloudy patches and irregular veins).

**FRENCH:** *Brocatelle Jaune* (yellow with brown and white veins); *Brocatelle Violette* (purplish-grey with brown and yellow patches); *Comblanchien* (light brown with fossils); *Jaune Lamartine* (rich yellow with fine brown, grey and red veins); *Lunel* (light fawn with few markings); *Napoleon* (light fawn with brown and red veins); *Rose* (red with black veins).

**GRECIAN:** *Cippolino* (pinkish-white with dark green wavy bands); *Skyros* (creamy-white or delicate yellow ground with gold and purple veins); *Tinos* (dark green ground with lighter green streaks and narrow irregular black and white veins); *Verde Antico* (light and dark green mixture with occasional whitish patches).

**ITALIAN:** *Breccia* (grey, purple and yellow mixture with white veins); *Dove* (lavender or dark grey, slightly veined); *Fleur de Peche* (rich purple with white mottling); *Levanto Rosso* (dark red, purple and green mixture); *Pavonazzetto* (ivory ground with irregular orange and rusty veins); *Pavonazzo* (similar to Pavonazzetto with purple veins; scarce); *San Stefano* (dark buff with stippled darker flecks); *Second Statuary* (white with grey or greyish-green veinings); *Statuary* (pure white and expensive; so called as it is principally used for statues); *Sicilian* (white with bluish cast); *Sienna* (all shades of yellow with purple and black veins); *Travertine*<sup>1</sup> (straw, amber and golden ground with irregular darker graining; bands of small pores characteristic).

**NORWEGIAN:** *Brèche Rosé* (pale rose-pink ground with white mottling); *Norge Clair* (white).

**SWEDISH:** *Swedish Green* (pale green ground with darker green ribboning and white mottling).

*Alabaster*, used for ornaments, electric light bowls, etc., is sulphate of lime. It is white when in its pure form. The true alabaster comes from Algeria and has been deposited as stalactites and stalagmites.<sup>2</sup> So-called alabaster is found in Derbyshire, Somerset and other parts of this country.

*Onyx Marbles* from Algeria, Brazil and Mexico are of calcium carbonate produced as stalactites and stalagmites. They are richly figured and are of many colours, varying from white to yellow, the characteristic veining being due to the presence of metallic oxides.

Marbles are obtained from the Devonian and Carboniferous systems.

(b) *Slates*.—A true slate is a metamorphic sedimentary clay rock. Originally the clay was deposited as a fine silt; this was compressed by vertical pressure into shale, which, when subsequently subjected to enormous lateral pressure accompanied by intense heat, was converted into slate. The forces producing this side pressure contorted the original horizontal *bedding planes*, and, in addition, rearranged the particles into inclined *cleavage planes*. An example

<sup>1</sup> *Travertine* or *Calcareous Tufa* consists of hardened masses of carbonate of lime deposited by springs; the compact variety is known as "travertine" and the light and spongy type is called "tufa."

<sup>2</sup> These are produced by the dropping of water containing carbonate of lime through fissures in the roofs of caves. Icicle-like stalactites (masses hanging from the roof) and stalagmites (deposits gradually built up on the floor) of calcium sulphate (or calcium carbonate) are thus formed.

of this formation is shown in Fig. 68 on p. 133, Vol. I, and, as there described, a block of slate is readily converted into relatively thin roofing slates by splitting it along the parallel planes of cleavage. The preparation, characteristics, etc., of slates are described in Chapter Five, Vol. I.

Welsh slates are obtained from the Cambrian, Ordovician and Silurian systems. The Bangor, Dinorwic (or Velineli) and Penrhyn slates are worked from the Cambrian (Olenellus Beds) rocks; the Festiniog (or Portmadoc) and Precelly slates are mined or quarried from the Ordovician (Llandeilo Beds) rocks; slates from Corwen and Llangollen are obtained from the Wenlock Beds (Silurian system) and are softer than most of those mentioned above (see Table IV).

Lake District green slates (Buttermere, Honister, Elterwater, Kentmere and Tilberthwaite) and those from the Burlington quarries are of the Ordovician age (Llandeilo Beds).

Cornish (Delabole) slates are obtained from the Upper Devonian series.

Scottish slates from Argyll (Ballachulish and Easdale), Dumbarton and Perth are from the Pre-Cambrian system.

Irish slates from Tipperary, Donegal, Kerry and Kilkenny are of the Ordovician age.

(c) *Quartzite* is a very compact, hard and durable metamorphic rock. Like slates, it is readily split into thin slabs, but it is very difficult to saw to panel sizes. When converted, the slabs have a very pleasing textured surface and attractive colour, ranging from grey, olive to golden. Whilst for centuries this has been used as a building material in Italy, where it is quarried, it has only recently been employed in this country on buildings as a floor and external and internal wall covering, the  $\frac{3}{4}$  to  $\frac{1}{2}$ -in. thick slabs being bedded in mortar.

## DEFECTS IN STONE

Certain defects in stone are mentioned on p. 39, Vol. I, and include clay-holes, mottle, sand-holes and vents.

DECAY of stone may be due to (1) incorrect bedding, (2) atmospheric impurities, (3) careless selection, (4) association of dissimilar stones, (5) efflorescence, (6) frost action and (7) corrodible metal fastenings. Regarding decay caused by:

1. *Incorrect Bedding*.—Serious weathering defects occur if stone is incorrectly bedded (see pp. 38 and 39, Vol. I), and especially if face-bedding (*e.g.*, with the natural bed vertical and parallel to the face of the wall) is resorted to. Blocks of stone must be built with the natural bed perpendicular to the pressure (see also 6 on p. 98).

2. *Atmospheric Impurities*.—A polluted atmosphere is the principal cause of decay of certain stones. Those containing calcium carbonate, such as limestones (ordinary and magnesian) and calcareous sandstones, are especially liable to attack.

The chief sources of atmospheric pollution are domestic coal fires and industrial furnaces. Such pollution occurs principally in the vicinity of large towns and manufacturing centres. The products of combustion of coal mainly responsible for decay of stone are acid gases, such as sulphur dioxide and trioxide, and soot; sulphurous acid and sulphuric acid are formed when the dioxide and trioxide respectively come into contact with water, such as rain. Although the acid gases are most concentrated in cities and industrial areas, they are