salts may not occur on the outer surface of the bricks during evaporation but may take place just below the surface. This is called *crypto-florescence* and may result in the bursting off of the outer skin.

Portland cement mortar and certain lime mortars may cause efflorescence and affect the brickwork ; soluble salts present in the soil, such as chlorides and nitrates, may also produce this condition when the ground water is absorbed.

Grizzling.—Common bricks, though of good shape, which are underburnt (indicated by a light colour and a dull sound when struck), and therefore weak, are called *grizzles* ; only suitable for inferior internal partition walls when little strength is required.

Iron Spots.—These are surface dark spots, due to the presence of iron sulphide in the clay, which render the bricks unsuitable for facings.

Laminations are generally caused by the air in the voids between the particles of clay not being eliminated in the grinding, pugging, etc., processes, and producing the formation of thin laminæ on the faces of bricks which may scale off on exposure to the weather (see " de-airing," p. 3).

Lime Nodules.—Bricks containing pieces of limestone left uncrushed in the clay during its preparation are quite unsuited for external walls or internal walls which are to be plastered, as the lime will expand when water is absorbed, causing cracking or disintegration (see p. 1).

Scumming or Kiln-white.—This is an unsightly discoloration of bricks, particularly those containing lime and iron sulphide, which have been fired in a continuous kiln. Several causes contribute to this condition, but it is chiefly due to the hot gases from the firing chambers (which contain sulphur) coming in contact with the damp bricks in the early drying chambers, and producing a thin brownish-white or grey film (usually sulphate of lime) on the surface. Such bricks are only suitable for commons. Scum is prevented if provision is made for the escape of steam in the drying zone of the kiln (p. 7) and if clean hot air is only used to dry the bricks. Barium carbonate powder or barium hydroxide is sometimes mixed with the clay before moulding to prevent scum formation. The carbonate in a fine powder form may be added to the clay before it enters the auger or pug mill, or, as is usual, it may be mixed with water and the solution thoroughly incorporated with the clay.

Distortion may be produced by overburning. Badly worn auger mouth-pieces and press moulds will cause the bricks to be badly shaped. Cracking may be caused by drying and cooling the bricks too quickly in the kiln. Careless handling of green bricks during manufacture will cause damage. Chipped, cracked and broken bricks, especially if underburnt, are common results of improper handling in course of transit.

Terms which are gradually falling into disuse include *place bricks* (similar to grizzles, see above) and *shippers* (sound but imperfectly shaped bricks used as ships' ballast).

CHARACTERISTICS OF BRICKS

These have been referred to in Vol. I, p. 2. Good bricks should be thoroughly burnt, as most well-burnt bricks are durable and capable of withstanding relatively heavy loads. As adequate firing in the kiln tends to eliminate any soluble salts in bricks, it follows that hard-fired bricks are relatively free from defects such as efflorescence and crypto-florescence (see p. 13). Conversely, underburnt bricks (usually denoted by an abnormal light colour and a dull sound when struck together) are comparatively soft, easily broken, are neither durable nor pressure-resistant (see p. 15), and are liable to defects produced by salts.

Good bricks should be free from the defects enumerated above and, if used as facings, should conform to one or other of the colours and textures mentioned on pp. 12 and 13.

PERMEABILITY.—Bricks for external use must be capable of preventing rain-water from passing through them to the inside of walls of reasonable thickness. In this connection the practice of specifying the maximum amount of water a brick shall absorb (usually " one-seventh of its own weight of water after twenty-four hours' immersion ") is not now considered desirable, for it does not follow that a brick is impermeable if it has a relatively small absorption. Much depends upon the character of the pores.

Some pores are continuous from face to face, and therefore rain-water readily passes through them to the inside, whilst other pores or cavities are not interconnected but are entirely enclosed by material, and do not affect permeability. A close-pored brick will freely absorb water which will not readily evaporate. But a brick which is more open-pored will absorb less moisture, which will evaporate more easily because of the increased air circulation ; it follows that such a brick (provided any connected pores are not too large as to allow the water to be blown through them) is more successful in preventing dampness on the inside.[1]

Further, it is difficult to lay certain dense and smooth-faced bricks owing to their lack of " suction," which prevents a ready adherence of the mortar. This lack of adhesion causes narrow fissures to appear between the bricks and the mortar joints. The result is that water penetrates through these cracks, and much dampness in solid brick walls is due to this cause, even though the bricks may be impermeable (see p. 43). Hence, bricks should be porous to a certain extent, the pores being neither too fine nor too open, to permit strong adhesion of the mortar. Incidentally, even if the joints are well filled with mortar, especially if it is a rich mix (see p. 25), fine hair-like cracks may develop, when the mortar shrinks on drying, through which water will readily pass to the inside.

Permeability Test.—A simple apparatus used for measuring the rate of absorption of water consists of a flat pyramidally shaped brass cover which is fitted over the brick (or other) specimen, which is usually 4-in. square ; a short length of vertical glass tubing, with its lower end fixed to the cover, is fitted to a fine bored glass tube (having a scale behind it) which is fixed horizontally at 8-in. above the top surface of the specimen ; a rubber pipe from a glass cylinder containing water is connected to the vertical tube ; the vertical faces of the specimen are waxed and thus made

[1] Briefly the distinction between absorption, permeability and porosity is as follows :

Absorption is the property of allowing water to enter a material.
Permeability is the property of allowing water to pass through a material.
Porosity is the proportion of void space in a material.