(*a*) Those of organic origin are formed of the fossil remains of mulluscs (minute animal organisms, such as snails, furnished with shells which consist of calcium carbonate), corals, etc., that have been deposited in lakes or in sea basins, and the accumulations subsequently hardened into rocks by pressure and cementing material. These are known as *shelly limestones*, well-known examples being Ancaster, Clipsham and Weldon (see Table VI and D, Fig. 34).

(*b*) Limestones of the chemically formed group consist of grains, each having a central core or nucleus (probably a sand grain or a fragment of a shell) round which concentric layers of calcium carbonate have been deposited from water. These grains, having the appearance of eggs or roe of a fish, are called *oölites*, and the stone is sometimes referred to as " egg stone " [1] or " roe stone " (see B and C, Fig. 34). The grains vary in size, stones having large grains being called *pisolite*. Fragments of shells may be present. Portland stone and those quarried in the vicinity of Bath (*e.g.*, Corsham Down, Monk's Park and St. Aldhelm Box Ground) are well-known examples of oölitic limestones (see Table VI and B and C, Fig. 34 [2]).

The grains are cemented together by a matrix consisting of carbonate of lime, called *calcite*, or a mixture of carbonate of lime, silica, alumina and magnesia. In some cases the grains are only cemented together at their points of contact (see B, Fig. 34), in other types (see C and D, Fig. 34) the cementing material completely occupies the spaces between the grains.

Carbonate of magnesia is present in most limestones (see Table VIII). Stones containing a relatively high proportion of this carbonate are called *magnesian limestones*. If the magnesium carbonate and calcium carbonate are present in approximately equal proportions, the rocks are called *dolomites* or *dolomitic limestones*; Anston and Park Nook are examples of dolomites (see Tables VI and VIII). A magnesian stone containing a large proportion of silica is classed as a *calcareous* or *dolomitic* or *magnesian sandstone*; White Mansfield stone is of this type (see p. 88 and Tables VI and VII).

Limestones are used extensively for building purposes. Their weathering properties are referred to on p. 97. Many are excellent for internal work on account of their agreeable colour and free working qualities, and for external walling in districts free from atmospheric pollution. Whilst certain limestones are well established as suitable building stones and have been widely used for this purpose, others are quite unsuited for external walls of buildings in districts where acid gases are produced by the burning of coal (see p. 97).

A limestone generally considered to be well suited for external ashlar work subjected to acid attack is Portland stone. It has been employed during the past three hundred years for many important buildings in London and the provinces, and whilst the external faces are liable to become affected, the erosion is usually so slight (sheltered surfaces being possibly an exception, see p. 98) and uniform as not to be detrimental. Another reason for its popularity is the attractive appearance of light and shade produced on the weathered surfaces of this stone. As mentioned on pp. 33 and 34, Vol. I, there are three [1] beds in a Portland stone quarry which yield stone used for constructional work, *e.g.*, the roach bed, whitbed and basebed, the whitbed being most suitable for general purposes. The structure of whitbed stone is illustrated at B, Fig. 34.

Many limestones are fine grained and easily worked. Those from Bath and Beer especially are so soft immediately after being quarried that they can be readily sawn and chiselled, and their fine grain and even texture render them particularly suited for delicate carving. It is because of these characteristics, together with their agreeable appearance, that they are selected for internal ecclesiastical work such as pulpits and alter screens. Kentish Rag, a hard siliceous limestone (see p. 43, Vol. I) is not easy to work.

The distribution of certain important limestone quarries and mines is shown in Fig. 33. These limestones are listed in Table VI. The chemical composition of some of them is given in Table VIII. Some idea of the structure of limestones may be obtained by reference to the enlarged sketches at B, C and D, Fig. 34.

The Pre-Cambrian, Cambrian and Ordovician systems do not contribute any building limestones of importance. The Silurian system yields building limestones in Shropshire where it is used locally. Good limestone is obtained from the Middle Devonian series and is quarried in Devon, Ashburton (see p. 96) and Radford being examples; some are finely veined and are of a rich colour; the former is used for its decorative qualities and the Radford stone has been extensively employed locally, including important buildings in Plymouth, Torquay, Ilfracombe, etc. The Carboniferous Limestone series furnishes highly decorative limestone in Derbyshire (*e.g.*, Hopton-Wood); this takes a high polish and is classed commercially as a marble (see p. 96); stone from this series is used locally in Somerset and South Wales; local use is also made in the West Riding of Yorkshire of limestone obtained from the Yoredale (or Wensleydale) Beds. Magnesian limestone occurs in the Permian system in Nottingham and Yorkshire. The Triassic system does not yield any building limestones.

The Jurassic system, especially the Oölites series, furnishes many important building limestones. A few are from the Lias series, including those quarried and employed locally in Oxfordshire, Worcestershire, Warwickshire and Glamorganshire. Ancaster, Clipsham and the Bath stones are from the Lower Oölites, and Portland stone is from the Upper Oölites series.

Kentish Rag, used for rubble masonry in the South of England, is from the Lower Cretaceous series and the white Beer stone is from the Middle Cretaceous series. As mentioned on p. 89, none of the rocks in the Cainozoic group is sufficiently hard for building purposes.

3. METAMORPHIC ROCKS.—These are either igneous or sedimentary rocks which have been altered or metamorphosed by heat (from the earth's interior) or pressure (caused by the weight of superimposed layers of material or to the

[1] Oölite is derived from *oon* = egg and *lithos* = stone.

[2] It will be observed that, in order to provide a useful comparison, A, B, C and D, Fig. 34, have been sketched to the same scale, a portion of each prepared slide being magnified and projected to permit of this.

[1] At two of the quarries worked by the South-Western Stone Co. Ltd., a bed of stone below the whitbed has been discovered which yields a highly decorative hard and compact limestone, known as " Perrycot." This is sawn into 1-in. thick slabs and is used for decorative wall linings, etc.