

ceras bullatum, *Trochus? helices*, *Bellerophon trilobatus*, *Chonetes lata*, &c., with numerous defences of fishes. These beds are well seen at Kington in Herefordshire, and at Downton Castle near Ludlow, where they are quarried for building.

b. *Gray Sandstone*, &c.—The next subdivision of the Upper Ludlow consists of gray calcareous sandstone, or very commonly a micaceous stone, decomposing into soft mud, and contains, besides the shells just quoted, the *Lingula cornea*, which is common to it and the Tilestone beds. The *Orthis orbicularis*, a round variety of *O. elegantula*, is characteristic of the Upper Ludlow; and the lowest or mudstone beds are loaded for a thickness of 30 feet with *Athyris navicula* (fig. 568). As usual in strata of the Primary periods, the brachiopodous mollusca predominate over the

Fig. 567.



Orthis elegantula, Dalm. Var. *orbicularis*,
J. Sow. Delbury.
Upper Ludlow.

Fig. 568.



Athyris (Terebratula) navicula, J. Sow.
Aymestry limestone; also in
Upper and Lower Ludlow.

lamellibranchiate; but the latter are by no means unrepresented. Among other genera, for example, we observe *Avicula* (or *Pterinea*), *Cardiola*, *Nucula*, *Sanguinolites*, and *Modiola*.

Some of the Upper Ludlow sandstones are ripple-marked, thus affording evidence of gradual deposition; and the same may be said of the accompanying fine argillaceous shales which are of great thickness, and have been provincially named "mudstones." In some of these shales stems of crinoidea are found in an erect position, having evidently become fossil on the spots where they grew at the bottom of the sea. The facility with which these rocks, when exposed to the weather, are resolved into mud, proves that, notwithstanding their antiquity, they are nearly in the state in which they were first thrown down.

The *bone-bed* of the Upper Ludlow deserves especial notice as affording the oldest well-authenticated example of the fossil remains of fish. It usually consists of a single thin layer of brown bony fragments near the junction of the Old Red Sandstone and the Ludlow rocks, and was first observed by Sir R. Murchison, near the town of Ludlow, where it is three or four inches thick. It has since been traced to a distance of 45 miles from that point into Gloucestershire and other counties, and is commonly not more than an inch thick. At May Hill two bone-beds were observed, with 14 feet of intervening strata full of Upper Ludlow fossils.* At that point immediately above the upper fish-bed numerous globular bodies were found, which were determined by Dr. Hooker to be the spores of a cryptogamic land-plant, probably Lycopodiaceous. These beds occur just

* Murchison's *Siluria*, pp. 137-237.