XV.—On the Lamellibranch and Gasteropod Fauna found in the Millstone Grit of Scotland.

By Wheelton Hind, M.D., B.S., F.R.C.S., F.G.S. *Communicated by* Dr J. Horne, F.R.S. (With Two Plates.)

(MS. received February 12, 1908. Read March 16, 1908. Issued separately September 2, 1908.)

PART I.

Introduction.

During the revision of the Midlothian coalfield by the Geological Survey, special attention was directed to the plant remains occurring in the Millstone Grit, with the view of obtaining evidence bearing on the probable boundary line between the Upper and Lower Carboniferous rocks. Mr Tait collected a number of plants from certain horizons in this division of the Carboniferous system, which were submitted to Mr Kidston, F.R.S., for determination. Those from the lower part of the Millstone Grit were regarded by Mr Kidston as belonging to the Lower Carboniferous flora, and those from the upper portion, to the Upper Carboniferous flora. While carrying on his work in the field, Mr Tait found certain fossiliferous bands in the basal portion of the Millstone Grit, charged with lamellibranchs, brachiopods, and other marine organisms, and associated with Lower Carboniferous species of plants. These observations were of service in tracing the base line of the Upper Carboniferous rocks round a large part of the Midlothian basin. It ought to be clearly understood, however, that this boundary line is based solely on the evidence supplied by the plants and fishes as determined by Mr Kidston and Dr Traquair respectively.

When the revision of the Midlothian area was completed, certain sections of the Millstone Grit in the counties of Linlithgow, Lanark, and Stirling were examined by Mr Tait, to see if they might furnish confirmatory evidence of the boundary line adopted in Midlothian. Owing to the economic importance of the fireclays in this division in Lanarkshire, which has led to extensive boring operations, the sequence of the lower part of the strata in that district is now well known. In the basal portion there are fossiliferous bands containing marine organisms just as in Midlothian. Though Lower Carboniferous plants have not been found in this division in the districts of Glenboig, Castlecary, or Torwood Glen, yet they have been met with in beds a little above the base of the Millstone Grit at Glasgow, and Upper Carboniferous plants have been obtained in the upper part of this division at Castlecary. It seems reasonable to infer, therefore, that the lower part of the Millstone Grit in the counties of Lanark, Linlithgow, and Stirling is on the same stratigraphical horizon as the basal portion in Midlothian with its marine bands and Lower Carboniferous flora.

While collecting the plants Mr TAIT obtained a large number of specimens of Lamellibranchiata, which were sent to me for identification. These were found in beds exposed in the Greenfoot Quarry, near Glenboig Station, Lanarkshire (Sheet 31, one-inch map); in the river Avon, Linlithgowshire (Sheet 31); in Torwood Glen, Stirlingshire (Sheet 31)*; and in Bilston Burn, Midlothian. At each of these localities the lamellibranch fauna was found not far below the line which has been drawn between the Upper and Lower Carboniferous floras, in accordance with Dr KIDSTON's determinations.

I was much surprised to meet with a lamellibranch fauna of which quite 50 per cent. of the species were, as far as I could discover, new to Europe, but which resembled very closely the lamellibranch fauna of the Coal Measures of Nebraska and Illinois of North America.

The most striking member of the fauna was the shell *Prothyris elegans*, Meek, this being the first occurrence of the genus in the Carboniferous rocks of Great Britain. DREVERMANN has described one species, *P. bergica*, from the lowest Carboniferous rocks of Germany, *Zeitsch. der Deutsche Geol. Gesel.*, vol. xiv., 1902, p. 498, pl. xiv. In many cases it was impossible to distinguish any characters sufficient to separate the Scotch and American species from each other, but it may be said that the faunas are generically the same. Moreover, the lamellibranch fauna shows a marked approach to Permian types.

In North America the fauna is accompanied by *Fusulina* and *Meekella*, two fossil genera which are absent in the West of Europe; but both occur in the *Spirifer mosquensis* zone of Russia, a zone which succeeds that of *Productus giganteus* in that country. There does not, however, seem to be the least connection between the fauna of the *Spirifer mosquensis* zone and that under examination. It is important to ascertain the horizon at which this interesting fauna occurs in Scotland, that it may be known where to look for its representatives elsewhere. At the outset there is a great difficulty, and one that must be grappled with in the near future.

The Lower Limestone series of Scotland contains the same coral fauna as the uppermost division of the Carboniferous Limestone of England, or its equivalent farther north, the Yoredale series, that is to say, the *Dibunophyllum* zone. The question at once arises, What are the homotaxial equivalents of the Edge Coal series and the Upper Limestone series of Scotland, south of the Border? This question can only be satisfactorily settled on palæontological lines.

There is the most striking difference between the lamellibranch fauna of the Scotch beds assigned to the Millstone Grit, and that which characterises the Millstone Grits and the Pendleside series of England and Ireland. Here the upper beds of Carboniferous Limestone, the *Cyathaxonia* beds, which themselves are the highest subdivisions of the *Dibunophyllum* zone, are succeeded by black shales and limestones with

* A preliminary statement referring to this collection of lamellibranchs was published in the Summary of Progress of the Geological Survey for 1905, pp. 147 and 148.

Pterinopecten papyraceus, Sow., sp., *P. carbonarius*, Hind, *Posidonomya Becheri*, Bronn, *P. membranacea*, M'Coy, *Posidoniella lævis*, Brown, sp., *Leiopteria longirostris*, Hind; and the black shales which intervened between the different grits of the Millstone Grit series yield *Pterinopecten papyraceus*, Sow., sp., *Posidoniella lævis*, Brown, sp., *P. minor*, Brown, sp., *Sedgwickia attenuata*, M'Coy, *Sanguinolites ovalis*, Hind, *Myalina verneuillii*, M'Coy, *Myalina Flemingi*, M'Coy, *Schizodus antiquus*, Hind, *Nucula æqualis*, Sow., *Nuculana stilla*, M'Coy, *Ctenodonta lævirostris*, Portlock, sp., the majority of which have not yet been found in Scotland. On the other hand, I have seen goniatites typical of the Upper Carboniferous beds of the Midlands, in the collection of Mr NEILSON; *Dimorphoceras Looneyi*, Phill., sp., *D. Gilbertsoni*, Phill., sp., from shale over the Hosie Limestone; *Glyphioceras reticulatum*, Phill., sp., from Gair; *G. Phillipsii*, Foord and Crick, from Thornliebank; and from East Kilbride, *G. vesica*, Phill., sp., and *Pterinopecten papyraceus*, Sow., sp. These species never are found in England until the close of the Carboniferous Limestone period, and always occur in beds which succeed rocks which have the coral fauna of the Lower Limestone series. I mention these facts that the importance of the whole question may be recognised, and with the idea that they may possibly lead to a solution of the long open question of the difference of the Carboniferous sequence in Scotland and England.

The brachiopod fauna is not rich in species, but indicates a late period of Carboniferous time. The special forms of the various species are identical either with those that occur in the very fossiliferous quarry 300 feet below the Millstone Grit at Congleton Edge, Cheshire, in connection with the *Glyphioceras spirale*, Phill., sp., beds, or in black shales which lie on the upper beds of Carboniferous Limestone in the Upper Nidd valley. The most interesting specimens in this connection are the numerous specimens of *Schizophoria resupinata*, Mart., sp., where some of the fine radiating lines which form the ornament of the shell terminate in small raised points as if there was an attempt to form a spine. This character is well marked in the Scotch and Congleton Edge shells. There is a species of *Lingula* which I suspect to be new to science.

The Cephalopoda are represented by a single species, which I doubtfully refer to *Glyphioceras Phillipsii*, Foord and Crick. The specimen is fragmentary, and is a cast of the outer surface of the shell, and does not show any sutures. The absence of Cephalopoda at this horizon is very marked compared with their abundance throughout the Pendleside series and the shales of the Millstone Grits of England and Ireland.

The Gasteropoda show a strong relation to the North American fauna. Several species I regard as identical with those figured and described from the Coal Measures of Nebraska.

Mr TAIT writes me that he "obtained no plants in the marine beds in the Greenfoot Quarry, in the Avon section, nor in Torwood Glen, but in Garngad Road, Glasgow, plants belonging to the Lower Flora occur in beds 50 to 100 feet above the Castlecary Limestone." "From the upper part of the Millstone Grit at Castlecary, plants belong-

ing to the Upper Flora were obtained, so that the horizon at which the flora changes is almost the same level as that in Midlothian. I think that all the lamellibranchs

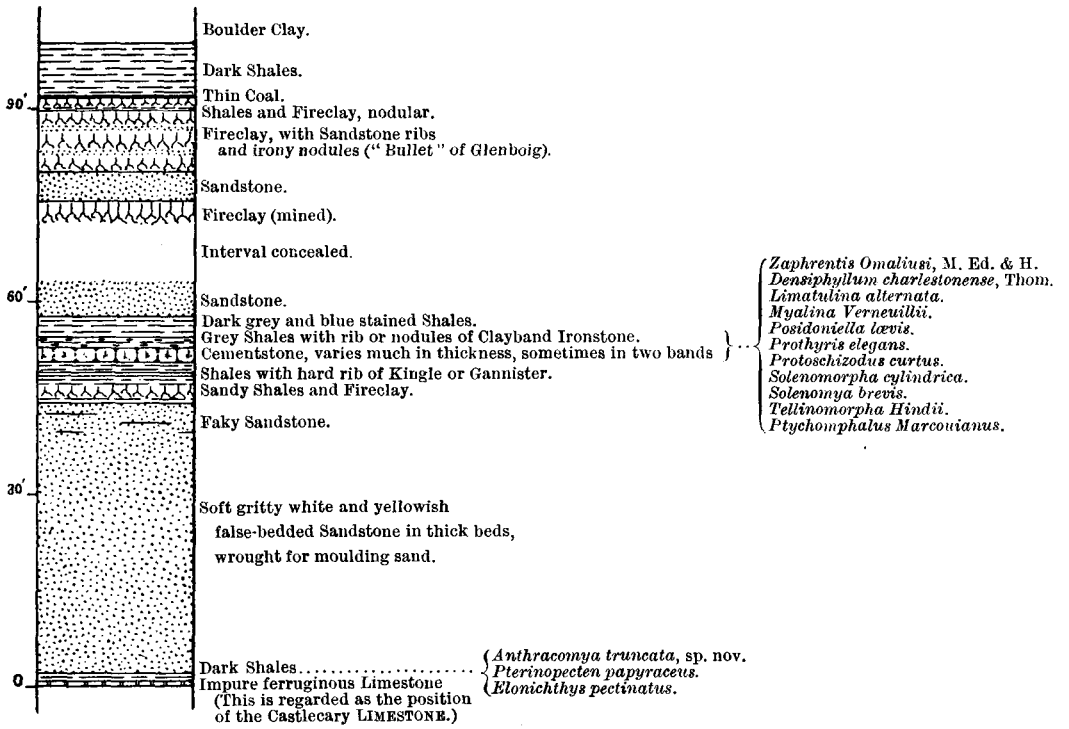


FIG. 1.—Vertical Section of Strata at Greenfoot Quarry, near Gain Farm, 3 miles N. of Coatbridge.

were obtained from beds containing a Lower Carboniferous flora, and just below the point where the Upper and Lower floras meet."

Certain species which were found to occur in the Basement beds of the Bristol

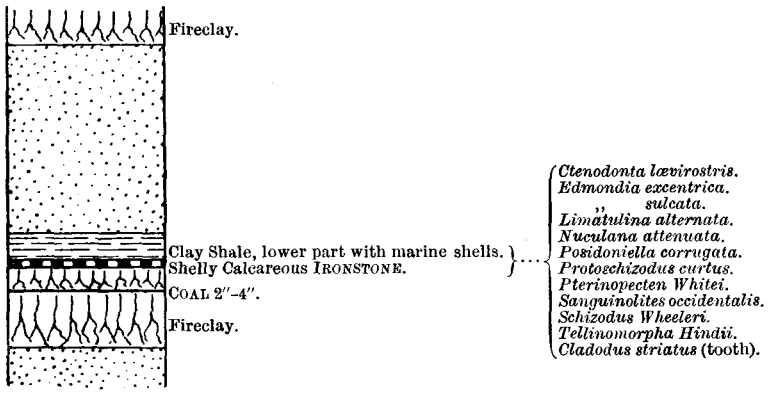


FIG. 2.—Section on the North Bank of the River Avon, West of the Railway Viaduct, 2½ miles W.N.W. of Linlithgow. Scale, 1 inch = 30 feet.

Coalfield were sent to me by Mr BOLTON for my opinion. Amongst them I recognised three species which were common to those beds and the Millstone Grit of Scotland, namely, *Palæolima retifera*, Shumard, *Grammatodon tenuistriatus*, M. and H., sp.,

and a new form named by Mr BOLTON *Tellinamorpha Hindii*. His paper is published in the *Quart. Journ. Geol. Soc.*, vol. lxiii. p. 445.

The annexed vertical sections illustrate the order of succession of the strata at the localities where the lamellibranchs were obtained; the one at Greenfoot Quarry has been kindly supplied by Mr HINXMAN, the second and third on the river Avon

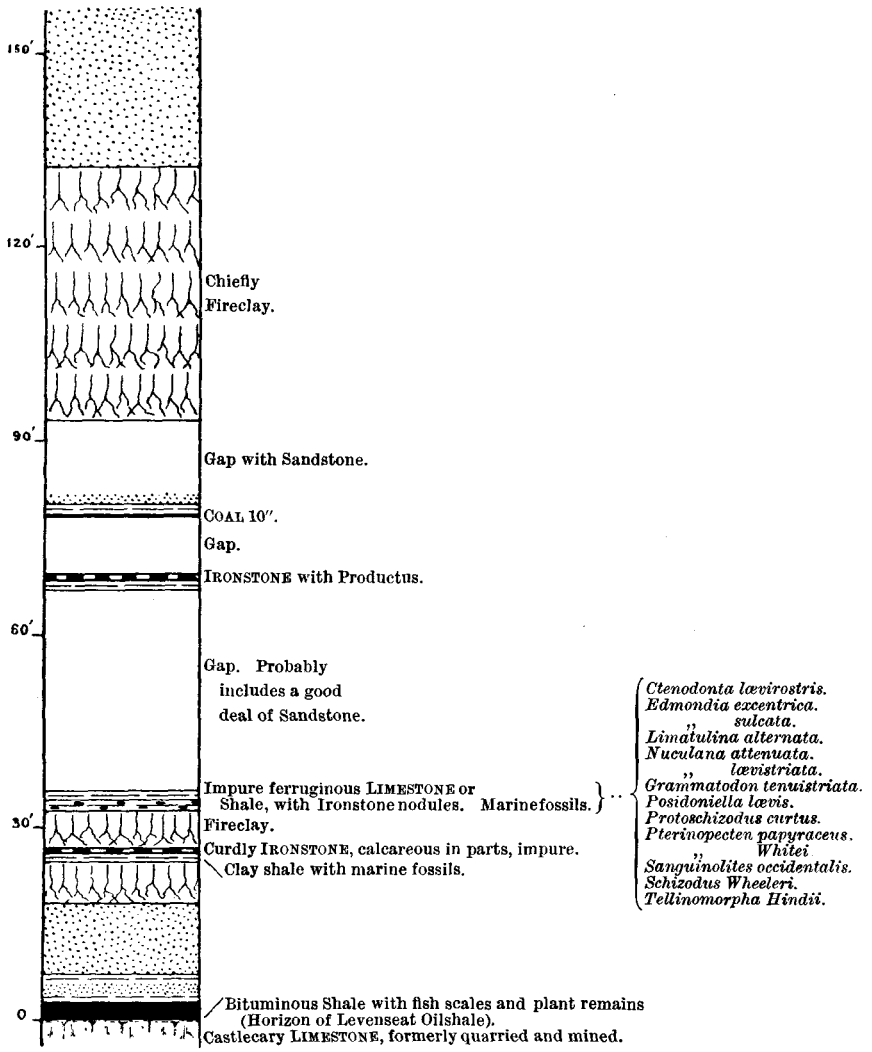


FIG. 3.—Section on the Banks of the River Avon, East of the Railway Viaduct a mile N. of Manuel Junction. One-inch Map 31. Scale, 1 inch = 30 feet.

by Mr CLOUGH, the fourth at Torwood Glen by Mr TAIT, and the fifth in Bilston Burn by Mr CLOUGH, and I owe a debt of thanks to Dr LEE for references to the discovery of *Prothyris* by DREVERMANN in Germany.

It is certain that the fossiliferous horizon indicated in the shorter section lies above those shown in the larger one, but, owing to the variability of the beds and an obscure fault, its exact distance above these horizons is doubtful. It cannot,

however, be lower than the thick fireclay, and it may be 30 or 40 feet above the top of it.

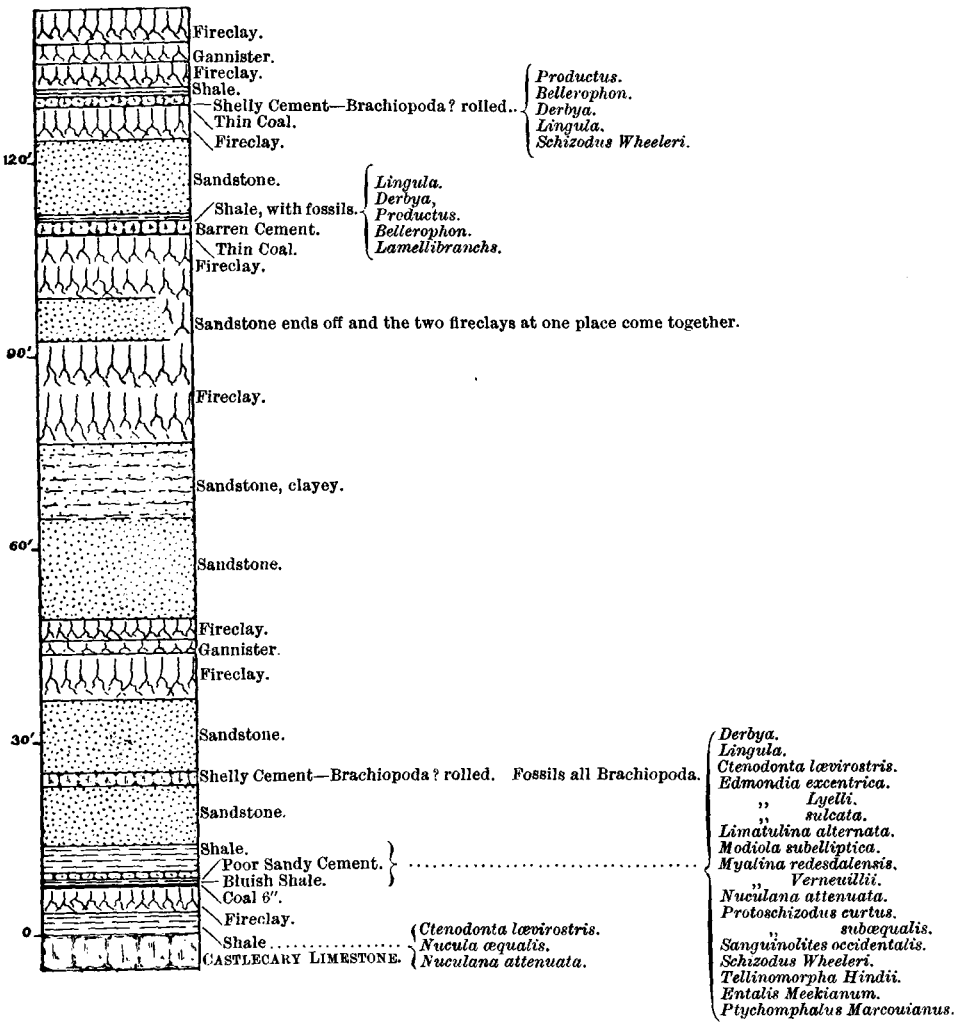


FIG. 4.—Section of Millstone Grit in Torwood Glen, 2½ miles N.W. of Larbert, Stirlingshire. One-inch Map 31. Scale, 1 inch = 30 feet.

Specimens T2143[B] – 2150[B], from Glencryan, 1½ miles S.S.E. of Cumbernauld, One-inch Map 31, include the species—

Posidoniella lævis, or *P. corrugata*.

Specimens T2176[B] – 2178[B], from Glencryan—as above, but lower in the series—contain— *? Edmondia Lyelli*.

Specimens T2214[B] – 2243[B] are from the Fireclay Works, ¾ mile a little N. of E. of Castlecary Railway Station, Stirlingshire. One-inch Map 31.

The following species were obtained here: *Sanguinolites*, sp., *Palæolima retifera*, Shumard, sp., *? Edmondia Lyelli*, Hind. This mine is sunk to the Castlecary Lime-

stone, so there is no doubt the beds from which these fossils were obtained overlie it, though the bed has not been recognised *in situ*.

Upper Carboniferous plants were got in this mine at 270 feet above the Castlecary Limestone. The species determined by Mr KIDSTON are *Sigillaria elegans*, Sternb. (abundant), *Lepidodendron obovatum*, Sternb., *Lepidodendron aculeatum*, Sternb.

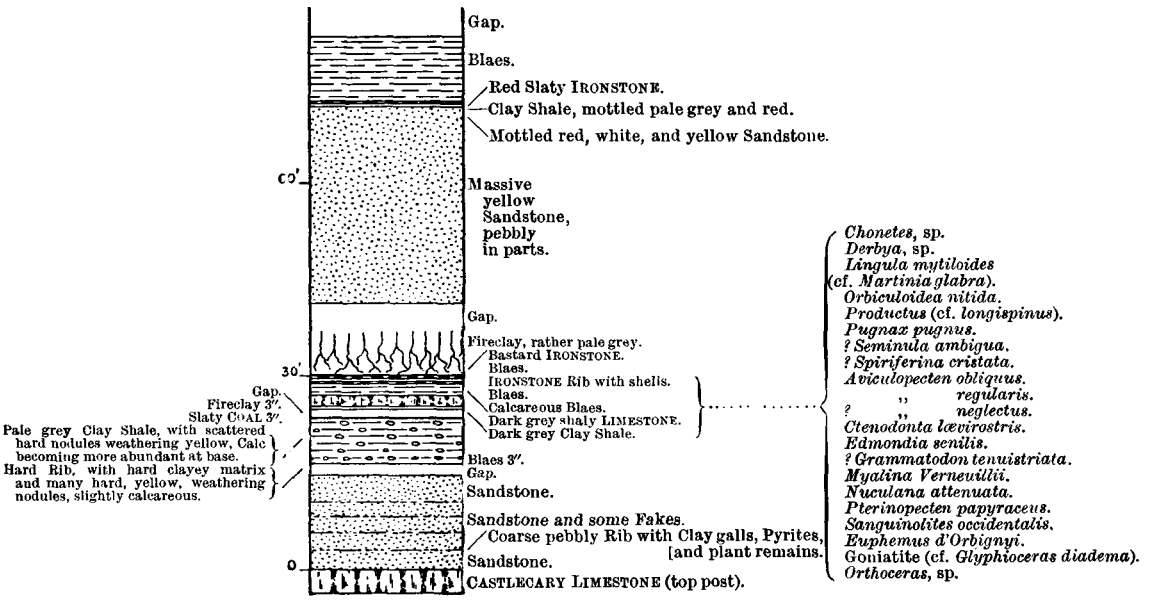


FIG. 5.—Vertical Section of Strata in Bilston Burn, near Polton, Midlothian.

PART II.

SPECIFIC DESCRIPTIONS.

Palæolima retifera, Shumard, sp., 1858. (Pl. I. fig. 1.)

Lima retifera, Shumard, 1858, *Trans. St Louis Acad. Sci.*, vol. i. p. 214.
,, ,, Geinitz ?, 1866, *Carb. und Dyas in Nebraska*, p. 36, pl. ii. figs. 20, 21.
,, ,, Meek and Hayden, 1872, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 188, pl. ix. fig. 5.
Palæolima retifera, Bolton, 1907, *Q. J. Geol. Soc.*, p. 462, pl. xxx. fig. 10.

Specific Characters.—Shell small, oblique, triangularly ovate, very moderately gibbose. The anterior border only slightly curved, the inferior broadly rounded, the posterior oblique and almost straight. The hinge line is short and straight. The umbones are subcentral and small. The anterior ear is small, compressed, triangular; the posterior very similar, and almost the same size. The valve is flattened near the anterior border and expands gradually so that the greatest convexity is near the posterior border, where the valve becomes bent on itself so as to form a flattened posterior surface.

Interior.—The shell is ornamented with many angular radiating ribs, somewhat

irregular in distribution, and those towards the posterior margin stouter than those in front. Occasionally ribs may bifurcate, but more frequently new ones arise between any pair. These ribs are crossed by fine concentric lines of growth. The ears are almost smooth.

Dimensions.—Pl. I. fig. 1. Specimen No. T2218[B], a right valve, measures: antero-posteriorly, 12 mm.; dorso-ventrally, 14 mm.

Localities.—Bed in pit shaft at Castlecary Fireclay Works.

Observations.—There is one specimen of this shell in the collection which I have referred to SHUMARD'S species. The very elaborate description and excellent figures given by MEEK and HAYDEN leave nothing to be said in addition. The British species most closely related is *Palæolima simplex*, Phillips. This shell is less triangular, comparatively broader, and has fewer but broader and less angular radiating ribs. MEEK and HAYDEN, following SHUMARD, refer their shell to *Lima*, but I have shown that the Carboniferous forms differ in certain details (*Brit. Carb. Lamell.*, vol. ii. p. 39) from typical *Limas*, and created the genus to receive them. The occurrence of the genus in rocks of Millstone Grit age in Scotland somewhat extends our knowledge of the vertical range of the genus.

Limatulina alternata, M'Coy, sp., 1844. (Pl. I. figs. 9, 10.)

Limatulina alternata, Hind, 1903, *Brit. Carb. Lamell.* (Pal. Soc.), vol. ii. p. 39, pl. xix. figs. 7–10, 12.

Seven examples of this shell have been obtained, five of which occurred in an impure ferruginous limestone or cement in the river Avon, between the Railway Viaduct and the outcrop of the Castlecary Limestone, in the county of Linlithgow. Some of the specimens are full grown and show no tendency to dwarfing or senile characters. For further details, my work on Carboniferous lamellibranchs (*op. supra cit.*) may be consulted. The figured specimens are numbered T1888[B] and T1818[B].

Pterinopecten Whitei, Meek, sp., 1872. (Pl. I. figs. 11–13.)

Aviculopecten Whitei, Meek, 1872, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 195, pl. iv. fig. 11, *a*, *b*, *c*.

Specific Characters.—Shell below medium size, subordinately quadrate, the left valve moderately convex, the right valve flattened. The anterior and lower borders rounded. The posterior bluntly rounded below, slightly sinuous above. The hinge line straight, meeting the posterior border with a well-marked angle. The umbones are small, pointed, flattened, not elevated, placed far forward. The anterior ear is small, somewhat angular, well defined from the valve by a deep sulcus, deeper in the right valve than in the left. There is no posterior ear, but the upper and posterior part is compressed and subalate. The surface is ornamented by flattened, flexuous, radiating ribs, irregular in size, being crowded and narrow anteriorly, broader and

more widely separated over the middle portion of the valve, becoming very fine and close on the compressed part of the valve, so as to appear obsolete to the naked eye. These radiating ribs are crossed by concentric, irregularly distributed lines and rugæ of growth.

Dimensions.—Pl. I. fig. 11. Specimen No. T2982[B] measures: antero-posteriorly, 15 mm.; dorso-ventrally, 14 mm.

Localities.—Linlithgow, river Avon, E. side of the Railway Viaduct, 35 to 40 feet above the Castlecary Limestone.

Observations.—A number of specimens of this species have been obtained, but from only one of the localities. The species agrees with the description given by MEEK (*op. supra cit.*), but is somewhat larger than his figured specimens. In the adult state the posterior margin becomes sinuous above, a fact not indicated in the small American specimen. The species has some affinity to *P. carbonarius*, Hind, but the ribs are broader and flatter and more flexuous, and more interrupted by concentric lines of growth. The distribution of *P. carbonarius* extends from fairly low down in the Pendleside series to the middle of the Coal Measures.

Pterinopecten papyraceus, Sow., sp.

I refer two fragments to this well-known species, one from the Linlithgow and the other from the Gair locality. Undoubted specimens, however, were obtained from the Bilston Burn. I feel fairly satisfied with my diagnosis, even in the fragmentary state of the specimens. It is at this horizon that I should expect the species to occur in force. In the Midlands it occurs immediately above the upper beds of Carboniferous Limestone or the beds denoted by the coral genera *Cyathaxonia* and *Amplexi zaphrentis*.

Aviculopecten carboniferus, Stevens, sp., 1858. (Pl. I. fig. 14.)

Pecten carboniferus, Stevens, 1858, *Amer. Journ. Sci. and Arts*, vol. xxx. p 261.
„ *Broadheadii*, Swallow, 1862, *Trans. St Louis Acad. Sci.*, vol. ii. p. 97.
„ *Hawni*, Geinitz, 1866, *Carb. und Dyas in Nebraska*, p. 36, pl. ii. fig. 19, *a*, *b*.
Aviculopecten carboniferus, Meek and Hayden, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 193, pl. iv. fig. 8; pl. ix. fig. 4, *a*, *b*.

Specific Characters.—Body of the shell triangularly ovate, convex, greatest length and breadth equal. The hinge line is moderately elongate, the umbones pointed, raised, and central. The inferior border is broadly rounded, the margin interrupted by the projection of the ribs as pointed processes. The anterior ear is large, compressed, somewhat rolled, its upper border projecting and its anterior edge prolonged into a point; the posterior ear larger than the anterior, pointed, its margin falcate. The ears are separated from the body of the valve by a deep concave sulcus.

Exterior.—The surface is ornamented with few (15) distant, regular, raised, rounded ribs, occasionally nodulose when they are crossed by transverse lines of growth. These ribs project beyond the lower margin in the form of spines.

Dimensions.—Pl. I. fig. 14. Specimen No. 15,731, a left valve, measures: antero-posteriorly, 18 mm.; dorso-ventrally, 17 mm.

Locality.—Millstone Grit of Hazel Hill, 5 miles N.E. of Pately Bridge, Yorkshire; and possibly Congleton Edge Quarry, Cheshire.

A single specimen, a left valve, is in the collection of the Geological Survey, Jermyn Street, from the Millstone Grit of Hazel Hill, Yorkshire.

Observations.—The specimen which I now refer to this species is fairly well preserved, but has the tips of each ear wanting. At the lower margin the ribs are seen to project as spines, but the matrix is too hard and coarse to make out whether the spines curved upwards as they are shown to do in MEEK and HAYDEN'S figure. The only other British Carboniferous example which is known to have had projecting ribs is *A. Murchisoni* (*Brit. Carb. Lamell.*, vol. ii. pl. xiv. fig. 4), a species which more closely resembles the American shell than any other of the genus. MEEK and HAYDEN describe the right valve as nearly flat, with surface markings as in the left valve but more obscure.

Two fragments in my possession from the Congleton Edge Quarry, upper part of the Pendleside series, probably belong to the species, although not present in the Scotch collection. I have inserted the description of *A. carboniferus* here because it is a member of the American fauna.

Aviculopecten obliquus, sp. nov. (Pl. I. fig. 8.)

Specific Characters.—Shell small, oblique; body of the valve ovate, acute. The right valve convex. The anterior margin is short and convex. The inferior descends and is broadly convex. The postero-inferior part of the valve produced and bluntly rounded. The line which forms the margin from the umbo to the postero-inferior angle is almost straight, and defines the valve from the posterior ear. The hinge line is straight, long, produced posteriorly into an acute point. The umbones are small, pointed, level with the hinge line, and placed very slightly anterior to the centre of the hinge line. The anterior ear is depressed, rolled, comparatively large and deep, separated from the valve by a fold and notch. The posterior ear is much compressed, triangular, pointed, its margin falcate.

Interior.—Not exposed.

Exterior.—The right valve is ornamented by many thick, nodulose, radiating ribs, between each pair of which linear plain ribs are intercalated. The anterior ear has a few radiating ribs; the posterior, fine concentric lines of growth.

Dimensions.—Pl. I. fig. 8. Specimen No. T4507[B], a right valve, measures: antero-posteriorly, 12 mm.; dorso-ventrally, 12 mm.

Locality.—Midlothian, Bilston Burn near Polton, bed 27 to 30 feet above Castlecary Limestone.

Observations.—Unfortunately only right valves of this species have been found. The nodular ornament is very well marked. One specimen, which consists of the fossil and its counterpart, shows an almost perfect shell; the other is a cast of the exterior.

The species has somewhat the characters of the ornament of *A. Murchisoni*; the obliquity of the valve and the deep posterior ear are not characteristic of that species. In *A. Murchisoni*, the right valve is flattened, and the ribs are much less nodular than in the left valve.

Aviculopecten regularis, sp. nov. (Pl. I. figs. 2, 3.)

Specific Characters.—Shell of moderate size, the left valve gibbose, the right flattened. The body of the valve triangular, the lower margin broadly rounded. The hinge line straight, equal in length to the greatest transverse diameter. Umbones small, pointed, subcentral. The ears are depressed, especially the anterior; the posterior has its upper margin produced to a point, and its posterior margin falcate.

Exterior.—The right valve has its anterior ear radially ribbed and its posterior almost smooth, but almost obsolete distant radiating lines can be seen with a microscope. The rest of the valve has fine flattened, close radiating ribs, becoming thicker as they approach the margin. The left valve has coarse, raised linear ribs; between each pair, fine secondary ribs appear towards the inferior margin. Concentric lines of growth are visible in the umbonal region. The ears of the left valve are not well seen.

Dimensions.—Pl. I. fig. 3. Specimen No. T4514[B] measures: antero-posteriorly, 16 mm.; dorso-ventrally, 13 mm.

Locality. — Midlothian, Bilston Burn near Polton, bed 27 to 30 feet above the Castlecary Limestone.

Observations.—Two specimens, a right and a left valve, which I think belong to each other, have been obtained, neither of which is, unfortunately, perfect. The marking of the left valve is well preserved. I have been unable to refer the specimens to any described species, and I have been obliged to consider it as a new species.

? *Aviculopecten neglectus*, Geinitz, sp., 1866. (Pl. I. figs. 4–7.)

Pecten neglectus, Geinitz, 1866, *Carb. und Dyas in Nebraska*, p. 33, T. ii. fig. 17.
Aviculopecten neglectus, Meek, 1867, *Amer. Journ. Sci. and Arts*, vol. xliv., sec. ser., p. 183.
„ „ Meek, 1872, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 193, pl. ix. fig. 1, *a*, *b*.
„ „ Meek and Worthen, 1873, *Geol. Surv. Illinois*, vol. v. p. 589, pl. 261, fig. 7.

Specific Characters.—Shell small, its body subovate, acute, only moderately gibbose. The margin is regularly rounded below. The hinge line straight, shorter than the greatest transverse diameter. The umbo is small, pointed, not elevated, subcentral. The anterior ear in the right valve is small and flattened, triangular, separated from the body of the valve by a groove and notch. It is ornamented by strong radiating ribs. The posterior ear is triangular, depressed, with fine radiating markings, its margin falcate.

Exterior.—The right valve has its body almost smooth, with fine concentric markings. The left valve is almost smooth in its juvenile condition, but becomes

finely radially striate near its lower margin in the more recent part of the valves. Shell very thin.

Dimensions.—Specimen No. T4503[B], a right valve, measures: antero-posteriorly, 10 mm.; dorso-ventrally, 10 mm. Pl. I. fig. 5.

Locality. — Midlothian, Bilston Burn near Polton, bed 27 to 30 feet above the Castlecary Limestone.

Observations.—Several specimens of the right valve of this species, but only two of the left, have been obtained. Comparing the specimens with the figures given by MEEK in the report on Nebraska (*op. supra cit.*), it will be seen that he gives a very perfect figure of the right valve, with which our specimens agree; but it would seem that he copied Geinitz's figure of the left valve, which I have reasons for thinking may have been a right valve with the ears imperfectly exposed, because the left-hand ear in that specimen has a falcate margin and should therefore be the posterior. Amongst the specimens from the Bilston Burn is a left valve (fig. 4, Pl. I.) which shows in its umbonal region a surface free from radiating ribs, but towards the margin ribs gradually arise and become close and numerous. The specimen is a left valve, and I have suspected that it is the left valve of the smooth right valves which agree with the American right valve in every essential character.

In vol. v. of the Geological Survey report on Illinois, WORTHEN gives the figure of the hinge plate, showing a number of parallel cartilage pits, closer on the anterior than on the posterior side, and a central cartilage cavity. If he is correct, the shell cannot be referred to *Aviculopecten*, but will require a new genus to be created for it.

MEEK figures a left valve with radial ribs, from Bed C, Nebraska, in which ? *A. neglectus* occurs, as *A. coxanus*, M. and W. It is possible that this may be the left valve, and that I am dealing with partially decorticated specimens, and am wrong in thinking that the valve was not radially ribbed in the umbonal region.

Posidoniella lævis, Brown, sp., 1841. (Pl. I. fig. 15.)

For synonymy, *vide* Hind, Pal. Soc., 1897, *Brit. Carb. Lamell.*, p. 94.

I have referred certain small shells to this species, which is extremely common in the shales of the Millstone Grit in the Midlands of England. The specimens are not good, and are small and crushed, but on the whole fairly distinctive of the species; it seems to have been very rare in Scotch localities, and dwarfed.

Myalina Verneuillii, M'Coy, sp., 1854. (Pl. I. fig. 16.)

For synonymy, *vide* Hind, Pal. Soc., 1897, *Brit. Carb. Lamell.*, p. 115.

I have referred some fragments of a large shell with a broad alate posterior end to this species, but they are also very suggestive of *M. redesdalensis*. Some smaller specimens one can positively refer to M'COY's species, which has been obtained in beds of the Millstone Grit series near Marsden, on Pule Hill, Yorkshire. *M. Flemingi* occurs

with this species at Pule Hill, and I have recognised that species in a collection from Garngad Road made by Mr J. NEILSON of Glasgow.

Locality.—9 to 10 feet above the Castlecary Limestone, Torwood, Stirlingshire; Greenfoot Quarry, near Gain Farm, Dumbartonshire; and Bilston Burn, Midlothian.

Nucula gibbosa, Flem., *vide* Hind, Pal. Soc., 1897, *Brit. Carb. Lamell.*, p. 178. Pl. I. figs. 18, 19.
Nuculana attenuata, Flem., sp., *vide* Hind, Pal. Soc., 1897, *Brit. Carb. Lamell.*, p. 195.
Ctenodonta lævirostris, Portl., sp., *vide* Hind, Pal. Soc., *Brit. Carb. Lamell.*, pp. 183, 210; pt. ii. p. 164.

These three species occur together at many horizons in the Carboniferous sequence, from the Calciferous Sandstone series to the Coal Measures.

It is interesting to note that each genus is represented in the Coal Measures of North America by a closely allied species—*Nuculana* (*Yoldia*) *subsulcata*, *Nuculana bellistriata*, *Ctenodonta* (*allorisma*) *reflexa*.

Nuculana lævistriata, Meek and Worthen, sp. (Pl. I. fig. 17.)

For synonymy, *vide* Hind, Pal. Soc., 1897, *Brit. Carb. Lamell.*, p. 205:

This species is found in the St Louis group of the Lower Carboniferous beds of North America, but in Scotland it is very common at Waulkmill Glen in the Upper Limestone series. It seems to be rare in the Millstone Grit localities.

Locality.—River Avon, between the outcrop of the Castlecary Limestone and the Railway Viaduct.

Modiola subelliptica, Meek, 1867. (Pl. I. fig. 20.)

Clidophorus (*Pleurophorus*) *occidentalis*, Geinitz, 1866, *Carb. und Dyas in Nebraska*, p. 23, pl. ii. fig. 6.
Pleurophorus subellipticus, Meek, 1867, *Amer. Journ. Sci. and Arts.*, vol. xliv., new ser., p. 181.
Modiola ? subelliptica, Meek, *Fin. Rep. U.S. Geol. Surv. Nebraska*, 1872, p. 211, pl. x. fig. 5.

Specific Characters.—Shell small, transversely triangular, comparatively convex. The anterior end is small, narrow and rounded. The posterior end comprises about four-fifths of the valve. The anterior border is narrow and elliptical. The lower border descends slowly, meeting the posterior with a broad, blunt curve. The posterior margin is very oblique and somewhat convex in contour, making an obtuse angle above with the hinge line. The latter straight, equalling in length almost half the antero-posterior diameter. The umbones are small, placed far forward, but not terminal. Well marked, rounded, oblique swelling, which gradually becomes obsolete, extends from the umbo to the postero-inferior angle. Above the ridge the dorsal slope is rapidly compressed, and below it there is a well-marked byssal compression.

Interior.—Not exposed.

Exterior.—The surface is adorned by close, fine, concentric lines of growth.

Dimensions.—Specimen No. T1712[B] measures: antero-posteriorly, 7 mm.; dorso-ventrally, 3 mm.

Locality.—Torwood Glen, Stirlingshire, 8 to 10 feet above the Castlecary Limestone.

Observations.—A single specimen of this shell has occurred, a left valve, and I have referred it to MEEK's species. The American shell reaches about 25 mm. in its transverse diameter, and therefore we must regard the Scotch specimen as immature.

Grammatodon tenuistriata, Meek and Worthen, sp., 1872. (Pl. I. fig. 21.)

Macrodon tenuistriata, Meek and Worthen, 1867, *Proc. Chicago Acad. Sci.*, i. p. 17.
Arca striata, Geinitz, 1866, *Carb. und Dyas in Nebraska*, p. 20, pl. i. fig. 32.
Macrodon tenuistriata, Meek and Hayden, 1872, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 207, pl. x. fig. 20, *a*, *b*.
Parallelodon tenuistriata, Bolton, 1907, *Q. J. Geol. Soc.*, p. 460, pl. xxx. fig. 12.

Specific Characters.—Shell small; somewhat transverely oblong, gibbose. The anterior end is bluntly rounded, the antero-superior angle well marked. The inferior and superior borders sub-parallel. The hinge line straight, the lower margin very slightly convex, deeply indented above its centre for the byssus. The posterior end obliquely truncate, almost straight. The umbones are turned, raised, incurved, and pointed, placed at the junction of the anterior and middle thirds of the hinge line. The body of the valve is convex, deeply indented towards the margin of the byssal sulcus. The dorsal slope is as much compressed as to be concave. It is separated from the rest of the valve by a well-marked angular ridge, which extends from the umbo to the postero-inferior angle.

Interior.—Normal.

Exterior.—The general surface of the valve is ornamented by the decussation of the concentric lines of growth by close radiating lines. The latter become so much stronger on the dorsal slope as to form strong radiating ridges.

Dimensions.—Pl. I. fig. 21. Specimen No. T1812[B] measures: antero-posteriorly, 12 mm.; dorso-ventrally, 7 mm.

Locality.—Linlithgow, right bank of river Avon between the Railway Viaduct and the outcrop of the Castlecary Limestone, and in the Bilston Burn section, Midlothian.

Observations.—*G. tenuistriata*, M. and H., is closely allied to *G. semicostatus*, M'Coy, of which it is probably a mutation. It is, however, much less transverse, deeper and more gibbose.

Only two examples of the species are in the collection. *G. semicostatus* is very abundant at a horizon a very little below that in which *G. tenuistriata* occurs, namely, below the Linn Spout Limestone. Mr H. WOODS has shown (*Ann. Mag. Nat. Hist.*, 1899, ser. 7, vol. iii. p. 47) that the name *Grammatodon*, Meek and Hayden, is prior to *Parallelodon* of the same authors, and must replace it. It appears that *Macrodon* of Lycett, founded for a Jurassic shell, was occupied for a genus of fishes and cannot therefore be used, and that there is no essential difference in the type of the hinge of the Carboniferous and Jurassic forms.

Protoschizodus curtus, Meek and Worthen, sp., 1866. (Pl. I. figs. 22, 23.)

Schizodus curtus, Meek, 1866, *Proc. Chicago Acad. Sci.*, vol. i. p. 18.
„ *rossicus*, Geinitz, 1866, *Carb. und Dyas in Nebraska*, p. 18, Tab. i. fig. 28.
„ *curtus*, Meek and Worthen, 1872, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 208, pl. x. fig. 13, *a*, *b*, *c*, *d*?, *e*.

Specific Characters.—Shell triangularly suborbicular, moderately gibbose, almost equilateral. The anterior margin almost straight above, oblique, bluntly rounded below in the inferior border, which is broadly convex. The posterior margin is narrowed, straight, obliquely truncate. Hinge line arched short. The umbones are well marked. raised, pointed, moderately gibbose, and central. Passing from the umbo obliquely to the postero-inferior angle is a well-marked angular ridge which separates the convex portion of the valve from the rapidly compressed dorsal slope.

Interior.—Muscle scars normal.

Exterior.—The surface is almost smooth, but obscure concentric lines of growth are apparent near the lower margin of the valve.

Dimensions. — Pl. I. fig. 22. Specimen No. T1982[B], a right valve, measures: antero-posteriorly, 16 mm.; dorso-ventrally, 15 mm.

Localities.—Stirlingshire, Torwood Glen, $2\frac{1}{2}$ miles N.W. of Larbert, 9 to 10 feet above Castlecary Limestone; Linlithgow, river Avon, right bank, between Railway Viaduct and outcrop of Castlecary Limestone; Greenfoot Moulding Sand Quarry, near Gain Farm, Dumbartonshire.

Observations.—Protoschizodus curtus resembles very closely *P. subæqualis*, de Kon, from the upper beds of Carboniferous Limestone of Thorpe Cloud, Upper Dibunophyllum zone; but the Scotch examples are less gibbose, more triangular, and have a more oblique, straighter anterior border. The umbones are more subcentral and more elevated. MEEK and WORTHEN recognised the close resemblance between the American shell and *Schizodus rotundatus* of the Permian. I think they were right in separating the species for several reasons. In the first place, *S. rotundatus* was established on a single example, and I believe has not been figured since KING's monograph was published in 1841; and we learn from the note on the explanation of the plate that "the figure makes the specimen more perfect than it really is." It is important, however, to note the close relationship between the three forms.

I have referred the species to *Protoschizodus* on account of its general shape and contour. This species is fairly common in at least two of the Scotch localities.

Schizodus Wheeleri, Swallow, sp., 1862. (Pl. I. figs. 22–28.)

Cypricardia ? Wheeleri, Swallow, 1862, *Trans. St Louis Acad.*, vol. i. p. 96.
Schizodus obscurus, Geinitz, 1866, *Carb. und Dyas in Nebraska*, p. 20, Tab. i. figs. 30, 31.
„ *Wheeleri*, Meek and Hayden, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 209, pl. x. fig. *a*, *b*, *c*, *d*, (*e*, *f*?).

Specific Characters.—Shell moderately gibbose; dorsal slope much compressed,

transversely subovate. The anterior margin is deep and regularly rounded, passing with uninterrupted curve into the lower border, which is also convex, but the segment of a larger curve than the anterior margin. The posterior end is narrowed, obliquely truncate, almost straight. The postero-inferior angle acute, the postero-superior obtuse. The hinge line is short, very slightly arcuate. The umbones are large, gibbose, elevated above the margin, incurved, and subcentral. Passing obliquely from the umbo to the postero-inferior angle is a well-marked subangular ridge which separates the dorsal slope from the convex portion of the valve.

Interior.—The hinge plate is normal.

Exterior.—The surface is ornamented in front by regular lines of growth, which become less marked over the posterior portion of the valve.

Dimensions.—Pl. I. fig. 24. Specimen No. T1865[B], a right valve, measures: antero-posteriorly, 26 mm.; dorso-ventrally, 20 mm.

Locality.—Stirlingshire, Torwood Glen, $2\frac{1}{2}$ miles N.W. of Larbert, in a bed 9 to 10 feet above Castlecary Limestone; Linlithgow, river Avon, about 100 yards below the Mill, right bank, at the bend where stream takes a northerly direction, about $\frac{1}{8}$ mile N. of Avonbank.

Observations.—This species is represented by a larger number of individuals than any other in the collection. It is seen that amongst them there is a fair amount of variation. The same thing is observed in the figures of the American types figured by MEEK. We can even match the larger form (fig. 1, *f*), doubtfully referred to the species by MEEK, amongst the Scotch specimens. There is certainly a much closer resemblance to the Permian *Schizodus obscurus* than to any other British species; but it would seem to connect *S. axiniformis*, which ranges from the upper part of the Carboniferous Limestone series (Redesdale ironstone) to the Coal Measures (Coalbrookdale), with the later form. From the study of a series it would appear that, with age, the angularity of the oblique ridge tends to disappear, and the posterior end becomes produced.

? *Anthracomya truncata*, sp. nov. (Pl. I. figs. 29, 30.)

Specific Characters. — Shell small, triangular, compressed, rapidly expanded posteriorly, greatest vertical and horizontal diameter equal. The anterior end is short, its margin rounded. The inferior border descends rapidly, joining the long, straight, obliquely truncate posterior border by an elliptical curve. The hinge line is straight; the longest transverse diameter of the valve forms a well-marked obtuse angle with the posterior border. The umbones are small, slightly elevated and swollen, placed at the junction of the anterior and middle thirds of the hinge line. The valve is obliquely swollen, forming a well-defined but gradually diminishing rounded ridge passing from the umbo towards the postero-inferior angle.

Interior.—Not exposed.

Exterior.—The surface is almost smooth, but under the lens close, fine concentric lines of growth, with here and there a stronger line, the latter being more conspicuous in the umbonal region. The periostracum apparently thick.

Dimensions.—Specimen No. T2743[B] measures: antero-posteriorly, 5 mm.; dorso-ventrally, 5 mm.

Locality.—In black micaceous shale in drain in bottom of Greenfoot Quarry, near Gain Farm, 3 miles N. of Coatbridge. (Position of Castlecary Limestone.)

Observations.—Two small pieces of black shale labelled T2742[B] and T2743[B] are covered with black shiny shells and fragments which are new to me. The shells are probably somewhat crushed, but they have the general shape and contour of *Anthracomya*, to which genus I am led to refer them. They differ from *A. valenciensis* in being more triangular and less globular, and in having a well-marked oblique rounded ridge and a very rapidly expanded posterior extremity. The comparatively thick periostracum is a fact in favour of affinity of this small shell to *Anthracomya*. One slab shows four fairly well-preserved specimens of left valves, the other a practically perfect specimen of the right valve.

For its size this species is more rapidly expanded posteriorly than any of its genus, and foreshadows the character of the large *Anthracomya Adamsii* and its variety *A. Adamsii*, var. *expansa*, of the middle portion of the Coal Measures of England. A slab labelled T2156[B], from a dark shale on top of a 2-inch coal resting on the Glenboig Fireclay Seam, Fireclay Mine, Glenboig.

Edmondia excentrica, sp. nov. (Pl. II. figs. 31, 32.)

Specific Characters.—Shell small, only moderately gibbose, subrotundate, quadrate, moderately transverse, inequilateral. The anterior end is bluntly rounded, the inferior margin broadly convex, the posterior blunt, convex, somewhat broader than the anterior. The hinge line arcuate. The umbones are small, incurved, placed in front of the middle portion of the valve.

Exterior.—The surface is ornamented with concentric lines and rugæ of growth, and are arranged somewhat obliquely to the long axis of the valve.

Dimensions.—Pl. II. fig. 32. Specimen No. T1945[B] measures: antero-posteriorly, 18 mm.; dorso-ventrally, 12 mm.

Localities.—Stirlingshire, Torwood Glen, $2\frac{1}{2}$ miles N.W. of Larbert, 9 feet above Castlecary Limestone; river Avon, $\frac{1}{4}$ mile S.E. of Inveravon, Linlithgowshire; Glencryan, $1\frac{3}{4}$ miles S.S.E. of Cumbernauld, Dumbartonshire.

Observations.—A typical *Edmondia*, with an affinity to *E. senilis*, but of quite a different habit of growth, hence its creation into a species.

The *Edmondia reflexa* of Meek, from the Coal Measures of North America, is a more transverse shell with more regular and less rugose markings.

Edmondia Lyellii, Hind, 1899. (Pl. II. fig. 35.)

For synonymy, *vide* Hind, Pal. Soc., 1899, *Brit. Carb. Lamell.*, vol. i. p. 300.

A fragment of what I take to be the right valve of this species was obtained at Torwood Glen, Stirlingshire.

Edmondia sulcata, Phillips, sp. (Pl. II. fig. 33.)

For synonymy, *vide* Hind, Pal. Soc., 1899, *Brit. Carb. Lamell.*, p. 318.

A single specimen of this shell has been obtained from the Millstone Grit horizon at river Avon, between the Railway Viaduct and the Castlecary Limestone, Linlithgow. The specimen, though crushed, is well preserved, and not to be mistaken. It is a right valve, and shows in places the radiating lines of tubercles with which the posterior portion of the valve was covered. Another better specimen was got on the same horizon at Torwood Glen, Stirlingshire. Other examples were got at Gain Quarry, Dumbartonshire. The figured example, No. T1858[B], is from the river Avon, on west side of the Railway Viaduct, 100 yards below the Mill.

Sanguinolites occidentalis, Meek and Hayden, sp., 1858. (Pl. II. figs. 36–38.)

Pleurophorus occidentalis, Meek and Hayden, 1858, *Trans. Albany Instit.*, iv.
" " Meek and Hayden, 1864, *Pal. Upper Missouri*, p. 35, pl. i. fig. 11*a*.
Clidophorus Pallasi, Geinitz pars., 1866, *Carb. und Dyas in Nebraska*, p. 23, pl. ii. fig. 3.
Pleurophorus occidentalis, Meek and Hayden, 1872, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 212, pl. x. fig. 12.

Specific Characters.—Shell ovate, oblong, broader behind than in front, obliquely gibbose. The anterior end is short, its margin rounded. The upper and lower borders subparallel. The posterior margin obliquely subtruncate, junction of lower and posterior borders bluntly rounded. The postero-superior angle well marked, obtuse. The umbones are small, pointed, directed forwards, only very slightly raised above the hinge line and placed far forwards. Passing obliquely from the umbo to the postero-inferior angle is a bluntly rounded ridge which separates a broad and compressed dorsal slope from the narrow and somewhat compressed body of the valve. The edge of the upper margin is thickened posteriorly, and forms a ridge; between it and the oblique ridge are two well-marked oblique lines which extend to the posterior border. Escutcheon well marked.

Interior.—Normal. Hinge plate apparently edentulous.

Exterior.—The surface is ornamented by somewhat irregular rugose but fine lines of growth, which become much less obvious on the dorsal slope.

Dimensions.—Pl. II. fig. 37. Specimen No. T2216[B], a left valve, measures: antero-posteriorly, 20 mm.; dorso-ventrally, 9 mm.

Localities.—Linlithgow, river Avon, right bank, between Railway Viaduct and the outcrop of the Castlecary Limestone; Stirlingshire, Torwood Glen, $2\frac{1}{2}$ miles N.W. of

Larbert, 9 to 10 feet above the Castlecary Limestone. Specimen No. T2216[B] is from the pit shaft of Steens Fireclay Works, ¾ mile E. of Castlecary Railway Station; Bilston Burn section, Midlothian.

Observations.—I have referred this species to the genus *Sanguinolites* rather than *Pleurophorus*, as there are no signs of the characteristic cardinal teeth of the latter genus. I think there can be little doubt of the relation of the shell to the American species. I have compared the suite of specimens with *Sanguinolites ovalis*, Hind, but the two radiating ridges on the dorsal slope at once separate it from this species. The figure of the specimens from Nebraska (*op. supra cit.*) is from the cast of an interior, copied from GEINITZ's work. It is shown to have three curious curved lines passing from the front of the umbo to the lower border. I cannot think that these are natural, and I have never seen any similar structure in a sanguinolitiform shell. The species is represented in the collection by seven examples, amongst which is a fairly well-preserved testiferous example, and a cast of the left valve (Pl. II. fig. 38).

This species belongs to the group of *Sanguinolites tricostatus*, but it is considerably less transverse than that species. Externally there is a strong resemblance to the *Pleurophorus elegans* of the Permian.

? *Allorisma reflexa*, Meek. (Pl. II. fig. 39.)

Allorisma (*Sedgwickia*) *reflexa*, Meek, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 217, pl. iv. fig. 15.

A small slab, No. T2177[B], is covered with a very strongly marked shell, of which, however, no single specimen is perfect. I refer it provisionally to *Allorisma reflexa*, Meek, with the description of which it seems to agree.

I have doubts whether MEEK's generic diagnosis is correct, as the shell has not the general shape usual in *Allorisma*.

The dimensions of one of the Scotch shells, a right valve, are: antero-posteriorly, 20 mm.; dorso-ventrally, 8 mm.

Locality.—Glencryan, 1¾ mile S.S.E. of Cumbernauld, Dumbartonshire, 10 to 20 yards down stream from the fault, and on the under side of the waterfall.

Tellinomorpha Hindii, Bolton, 1907. (Pl. II. figs. 40–42.)

Tellinomorpha Hindii, Bolton, 1907, *Q. Journ. Geol. Soc.*, vol. lxiii. p. 460, pl. xxx. fig 8, *a*, *b*.

Specific Characters.—Shell somewhat transverse, gibbose, with a much-compressed dorsal slope, inequilateral. The anterior end is short and narrowed, its margin rounded. The inferior border is gently curved, and meeting the posterior at a well-marked angle. The posterior border is obliquely truncate, almost straight, moderately short, making an obtuse angle with the hinge line, the latter straight. The umbones are gibbose, elevated, incurved, and situated in front of the middle of the valve. Lunule large and broad. Escutcheon narrow, but well marked. From the umbo to the postero-inferior

angle of the valve extends a blunt subangular ridge, which divides the convex portion of the valve from the concavity of the dorsal slope.

Interior.—Not known.

Exterior.—The surface of the valve is ornamented with numerous concentric, irregular rugæ and lines of growth, which tend to become obsolete on the dorsal slope.

Dimensions.—Specimen No. T2450[B] measures: antero-posteriorly, 11 mm.; dorso-ventrally, 7 mm.; gibbosity of valve, 3 mm.

Localities.—Dumbartonshire, Greenfoot Moulding Sand Quarry, near Gain Farm, 3 miles N. of Coatbridge; Stirlingshire, Torwood Glen, $2\frac{1}{2}$ miles N.W. of Larbert, 9 to 10 feet above the Castlecary Limestone; Linlithgow, river Avon, 35 to 40 feet above the Castlecary Limestone.

Observations.—This species is represented in the collection by a very large number of individuals, by far the largest number of which came from the Gain Quarry. The specimens occur in ferruginous nodules which lie above the Upper Cementstone. The shell has a distinctive appearance, being very rugose for so small a shell. The narrowed truncate posterior end and well-compressed dorsal slope, comparatively large lunule and escutcheon, indicate fairly conclusively, even in the absence of details of the hinge and interior, the generic affinity of the species. The genus *Tellinomya* is represented in the Coal Measures of North America by *Tellinomya* (*Allorisma, Sedgwickia*) *granosa* of SHUMARD, and probably the *Allorisma* (*Sedgwickia*) *subelegans* of MEEK. The former species is very much larger than the one just described, but the latter agrees with it very well as to size. From the figure and descriptions, the ornament appears to be regular, and the shell is described by MEEK as rather compressed, a character which does not suit the Scotch species. With a strong lens, I think the remains of the characteristic tubercles with which the surface of shells belonging to the genus are covered are to be seen. Since writing the description I recognised the species in a collection made by Mr H. BOLTON from the base of the Coal Measures of Bristol, who has published a description and figures (*op. supra cit.*). He appears doubtful of the genus, and suggests *Parallelodon*, but I cannot accept this view. The small amount of the hinge plate that I have seen has none of the characters of that genus. The antero-superior angle of the shell is quite unlike the arciform type, and is rounded, and not square and compressed.

Solenomorpha cylindrica, sp. nov. (Pl. II. figs. 43, 44.)

Specific Characters.—Shell small, narrow, transverse, very inequilateral, dorsal and ventral margins subparallel. The anterior end is comparatively elongate, narrow; its anterior superior angle almost pointed, the border elliptically curved. The posterior end is truncate, blunt, not much narrowed, making a rounded angle below with the inferior margin, and a slightly obtuse angle with the hinge line above. The umbones are compressed, elongate, and not elevated. The dorsal slope is slightly compressed,

bounded below by an obscure ridge which continues from the umbo to the postero-inferior angle.

Interior.—Not observed.

Exterior.—The surface appears to be almost smooth.

Dimensions. — Specimen No. 2441, a left valve, measures: antero-posteriorly, 9 mm.; dorso-ventrally, 3 mm. (Pl. II. fig. 44.)

Locality.—Dumbartonshire, Greenfoot Moulding Sand Quarry, near Gain Farm, 3 miles N. of Coatbridge.

Observations.—I have referred these specimens to the genus *Solenomorpha* on account of the elongate form and the peculiar elongated anterior end and the narrow compressed umbones. The posterior end is broader than is usual in species of this genus. The American Coal Measures species (*Solenopsis*) *Solenomorpha solenoides* of GEINITZ has the normal condition of a narrowed posterior end and a somewhat less prolonged anterior end.

Solenomya brevis, sp. nov. (Pl. II. figs. 45–47.)

Specific Characters.—Shell small, transverse, tumid, lenticular, narrowed at both extremities, very inequilateral. The anterior end long, its margin elliptical. The inferior margin is convex; the posterior truncate, rounded. The hinge line is gently arched. The umbones are inconspicuous, elongate and adpressed, placed far back so that the posterior end is short and rapidly compressed, especially above.

Interior.—Normal.

Exterior.—Almost smooth, with very fine concentric striæ of growth.

Dimensions.—Pl. II. fig. 46. Specimen No. T2718[B] measures: antero-posteriorly, 16 mm.; dorso-ventrally, 8 mm.; gibbosity of valve, 3 mm.

Locality.—Dumbartonshire, Greenfoot Moulding Sand Quarry, near Gain Farm, 3 miles N. of Coatbridge.

Observations.—This species belongs to the group of *Solenomya*, which does not possess radiating ribs passing across the middle part of the valves. The absence of these ribs and the peculiar boat-shaped valve at once distinguish the species from *S. cylindrica*, which occurs at the same horizon. Its nearest congener is *S. excisa*, but this is a much larger and more transverse shell.

Solenomya cylindrica, sp. nov. (Pl. II. figs. 60, 61.)

Specific Characters.—Shell small, narrow, transversely elongate, gibbose, very inequilateral. Anterior end long, its margin bluntly rounded. The hinge line and inferior border are almost parallel. The posterior end narrower than the rest of the valve, its margin elliptical. The umbones are small, not elevated, excavated posteriorly, and placed in the posterior fourth of the hinge line.

Interior.—Normal.

Exterior.—The surface is almost smooth, but with the microscope fine concentric lines of growth are visible. The valve is crossed by several radiating obscure flattened ribs, apparent even in casts.

Dimensions.—Pl. II. fig. 60. Specimen No. T1984[B], a right valve, measures: antero-posteriorly, 19 mm; dorso-ventrally, 7 mm.

Locality.—Dumbartonshire, Greenfoot Moulding Sand Quarry, near Gain Farm, 3 miles N. of Coatbridge.

Observations.—The species differs from *S. costellata*, M'Coy, being much more gibbose and comparatively more transverse and much narrower. The radiating ribs are much less obvious. Three specimens are present in the collection. It is possible that the species is a mutation of *S. costellata*, for there is no doubt that the two forms are closely related, but the differences seem to me to be sufficiently strong to be indicated by a new term. Apparently the genus is represented in the Coal Measures of Illinois, for the name of the genus occurs twice in the list on page 126 of the *Final Report of U.S. Geological Survey of Nebraska*, but no mention is made of any species in the text.

Genus, *Prothyris*, Meek, 1869.

Prothyris, Meek, 1869, *Proc. Acad. Nat. Sci. Philad.*, p. 172.
„ Meek, 1871, *Amer. Journ. Conch.*, vol. vii. p. 5, pl. i. fig. 3.
„ Meek, 1872, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 223, pl. x. fig. 9, *a*, *b*.
„ Hall, 1885, *Geol. Surv. N. York*, Pal., vol. v. pt. i., Lamellibr. ii., p. xl.
„ Miller, 1889, *N. Amer. Geol. and Pal.*, p. 504.
„ Whidborne, Pal. Soc., 1890, *Devonian Fauna*, p. 86.

Generic Characters.—Shell compressed, narrow, transversely elongate, with a small ear-like process from the antero-posterior angle, separated from the shell by an angular ridge, probably for the byssus. Dorsal slope compressed.

Observations.—The genus is easily recognised by the peculiar-shaped process at its anterior end. The genus was founded by MEEK for a shell from the Coal Measures of Nebraska. The original account (*op. supra cit.*) was very meagre, and unaccompanied by any figures. However, in 1871 he gave figures, and, I presume, a more elaborate description, and again in 1872 (*op. supra cit.*). In North America the genus was subsequently found to occur as low as the Hamilton series, where it is represented by two species. Two others are known from the Chemnung and one from the Waverley Sandstone. In England, the Rev. G. F. WHIDBORNE has described three species from the Marwood and Pilton beds of North Devon.

The internal characters are not known. I think it probable that the ear-shaped process contained the anterior abductor muscle, and the hollow separating it from the rest of the shell was for a byssus. Fischer doubtfully places the genus in the *Solenidæ*. Apart from the anterior ear-like process, the shell has a strong resemblance to some species of *Sanguinolites*.

Prothyris elegans, Meek, 1871. (Pl. II. figs. 48–50.)

Prothyris elegans, Meek, 1871, *Amer. Journ. Conch.*, vol. vii. p. 5, pl. i. fig. 3.
,, ,, Meek and Hayden, 1872, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 223, pl. x. fig. 9, *a*, *b*.

Specific Characters.—Shell moderately compressed, transversely oblong, dorsal and ventral margins straight and parallel. The anterior superior angle is expanded into a small, pear-shaped process, not extending below the upper third of the border, the broad end pointing downwards and forwards. This process is separated from the rest of the shell by a raised ridge, which is continued below as the anterior margin, which is bluntly rounded. The posterior margin is obliquely subtruncate and almost straight. The postero-inferior angle bluntly rounded; the postero-superior angle almost obtuse. The umbones very small, depressed, and placed very far forwards: they would be terminal were it not for the ear-like expansion. The upper margin of each valve is compressed by a shallow groove immediately below the hinge line. Another groove passes obliquely from the region of the umbo towards the posterior margin some little distance below. Below these two grooves is a rounded ridge, which becomes broader as it approaches the posterior end. Below this the valve is very gently convex.

Interior.—Unknown.

Exterior.—That portion of the valve near the upper margin and the dorsal slope is almost smooth. Nearer the ventral border there are fine close lines of growth, parallel with the margins.

Dimensions.—Pl. II. fig. 48. Specimen No. T2505[B], a right valve, measures: antero-posteriorly, 17 mm.; dorso-ventrally, 5 mm.

Locality.—Dumbartonshire, Greenfoot Moulding Sand Quarry, near Gain Farm, 3 miles N. of Coatbridge. Horizon: Millstone Grit of Scotland.

Observations.—Although the Rev. G. F. WHIDBORNE has recorded three species of the genus *Prothyris* from the Devonian rocks of England, it has not been previously found in the Carboniferous beds of Great Britain (*vide ante*, p. 332). The type of the genus is *Prothyris elegans*, a species which occurs in the Coal Measures of Nebraska and Illinois. I have been unable to note any specific difference between the American and Scotch specimens after careful comparison with a series from Nebraska in my collection. Many examples have been obtained by Mr. TAIT from the locality named above—fortunately right and left valves. In some the ear-like process which is characteristic of the genus has broken away. The left valve is represented by the fossil and its counterpart, the latter showing the ear very perfectly. I have seen other examples in the possession of Mr. J. SMITH of Dalry.

GASTEROPODA.

Loxonema nanum, de Koninck, 1881. (Pl. II. fig. 51.)

Loxonema nanum, de Koninck, 1881, *Ann. Mus. Roy. d'Hist. Belg.*, tome vi. p. 50, pl. iv. figs. 45, 46.

Specific Characters.—Shell very small, elongate; spire consisting of 8 to 9 whorls.

Regularly convex. Suture lines well depressed; often a slight ridge immediately above the suture.

Dimensions.—Specimen No. T2182[B] measures: height, 4·5 mm.; breadth, 1·5 mm.

Localities.—Moulding Sand Quarry, Garngad Road, Glasgow; Dumbartonshire, Greenfoot Moulding Sand Quarry, near Gain Farm, 3 miles N. of Coatbridge.

Observations.—Two specimens of this minute shell have been obtained. It is almost characterless, and I refer it on this account to the very small shell named by DE KONINCK *L. nanum.*

Naticopsis brevispira, de Ryckholt, sp. (Pl. II. figs. 52, 53.)

I described this species as occurring in a marine band below the Gin Mine Coal of the North Staffordshire coalfield (*Q. J. Geol. Soc.*, vol. lxi. p. 533, pl. xxxv. fig. 10). A single specimen has been obtained from Torwood Glen, Stirlingshire.

Macrocheilina, sp. (Pl. II. fig. 59.)

Fragments of a small elongate shell with a spire of five whorls have been obtained, but it is impossible to determine the species. The height is 4·5 mm. The specimen is numbered T1929[B].

Locality.—Linlithgowshire; river Avon, W. of the Railway Viaduct, about 100 yards below the Mill and $\frac{1}{8}$ mile N. of Avonbank.

Ptychomphalus Marcouianus, Geinitz, sp., 1866. (Pl. II. fig. 55.)

Pleurotomaria Marcouiana, Geinitz, 1866, *Carb. und Dyas in Nebraska*, 1866, p. 10, Tab. i. fig. 10.
" " Meek and Hayden, 1872, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 223, pl. xi. fig. 8.

Specific Characters.—Shell small, cone rapidly expanding, spire of 5 to 6 whorls, of which the larger comprises nearly the whole of the shell. The upper portion of the whorl is convex, and in the last whorl projects beyond the two keels of the band of the sinus, so that the latter is finally not marginal. It is ornamented with regular close-set spiral ridges. The portion of the whorl above the band of the sinus (*i.e.* nearer the apex) is flattened, and in the early whorls obliterates the sinus. The ornament consists of spiral bands which are moniliform internally, the points becoming small in each successive row till they become obsolete.

Dimensions.—Pl. II. fig. 55. Specimen No. T1779[B] measures: height, 6 mm.; breadth, 7 mm.

Localities.—Stirlingshire, Torwood Glen, $2\frac{1}{2}$ miles N.W. of Larbert; Dumbartonshire, Greenfoot Quarry, near Gain Farm, 3 miles N. of Coatbridge.

Observations.—I have referred these specimens to GEINITZ's species, trusting to the figures in his and MEEK's works. I have been fortunate enough to obtain for study a very

beautifully preserved example which shows the character of the ornament very perfectly. I can find no figure of any British Carboniferous shell which in any way agrees.

Entalis Meekianum, Geinitz, sp., 1866. (Pl. II. fig. 54.)

Dentalium Meekianum, Geinitz, 1866, *Carb. und Dyas in Nebraska*, p. 13, Tab. i. fig. 20.
" " Meek and Hayden, 1872, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 224, pl. xi. fig. 16, *a*, *b*.

Specific Characters.—Shell a conical tube with a gentle curvature; aperture circular. Lines of growth fine, with irregular deeper sulci.

Locality.—Stirlingshire, Torwood Glen, $2\frac{1}{2}$ miles N.W. of Larbert. T1765[B].

Observations.—A single specimen of this shell has occurred. The exterior is not well preserved, but seems to be smooth. It may be decorticated, however. *Dentalium Meekianum*, Geinitz, from the Coal Measures of Nebraska, is said to have fine moderately distinct lines of growth passing very obliquely round the shell, with here and there a deeper sulcus. Of this character I can see no trace on the Scotch specimen.

A species of the genus is not uncommon in the marine beds of Congleton Edge, 300 feet below the third grit. It is much larger than the Scotch specimen, but of course this is not of specific value, and it may be said that only the narrow terminal portion of the latter is preserved. The Congleton Edge specimen has no longitudinal striæ, but has almost concentric lines of growth with irregular deeper sulci in places, thus corresponding to MEEK's description, to which I have alluded above. MEEK draws attention to the fact that GEINITZ represented the lines of growth in his figures as if they were spiral—a fact which he states to be incorrect. I have followed DE KONINCK in using the generic name of *Entalis*, this genus possessing a slit on the dorsal surface of the posterior or narrow end which is absent in *Dentalium*.

Euphemus d'Orbignyi, Port., sp. (Pl. II. figs. 57, 58.)

Bellerophon d'Orbignyi, Portlock, 1843, *Rep. Geol. Londonderry*, p. 401, pl. xxix. fig. 12.
? *Bellerophon carbonarius*, Cox, 1857, *Kentucky Geol. Rep.*, vol. iii. p. 562.
" " Geinitz, 1866, *Carb. und Dyas in Nebraska*, p. 6, Tab. i. fig. 8.
" " Meek and Hayden, 1872, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 224, pl. iv. fig. 16; pl. xi. fig. 11, *a*, *b*, *c*.
Euphemus d'Orbignyi, de Koninck, 1833, *Ann. Mus. Roy. d'Hist. Nat. Belg.*, tome viii. p. 156, pl. xlii. bis, fig. 5; pl. xliii. figs. 9–12; pl. lxii. figs. 10–12.

Specific Characters.—Shell gibbose, umbilicus small, sides compressed. Aperture, transverse subtruncate. The surface is ornamented by about twenty-four spiral ridges separated by concave spiral sulci, which become obsolete over the greater portion of the terminal whorl, and are closer together on the side of the umbilical slope,

Localities.—Stirlingshire, Torwood Glen, $2\frac{1}{2}$ miles N.W. of Larbert; Linlithgowshire, river Avon; Midlothian, Bilston Burn section.

Dimensions.—Pl. II. fig. 57. Specimen No. T1756[B] measures: height, 16 mm.; transversely, 16 mm.

Observations.—PORTLOCK states that he described his species from a single example, which he stated was obtained from Shale in Tyrone. DE KONINCK referred several specimens from the Carboniferous Limestone of Visé to this species, and gave numerous figures. I am able to detect no specific difference between the descriptions and figures of *Bellerophon carbonarius*, Cox, from the Coal Measures of Nebraska, and the Scotch examples, and have come to the conclusion that both should be referred to PORTLOCK's species.

Euphemus, sp.

Two poor specimens, with a finely reticulate ornament, were obtained at Torwood Glen, Stirlingshire. I don't think that they belong to any described species, but the shells are much too imperfect to serve as types for a new species. Nos. T1776[B], T1799[B].

Bellerophon Marcouianus, Geinitz, 1866. (Pl. II. fig. 56.)

Bellerophon Marcouianus, Geinitz, 1866, *Carb. und Dyas in Nebraska*, p. 7, Tab. i. fig. 12.
" " Meek and Hayden, 1872, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 226, pl. xi. fig. 13, *a*, *b*.

Observations.—A single species from Torwood Glen must, I think, be referred to the species figured by CONRAD from the Lower Coal Measures of Western Virginia. MEEK figures a fragment only, but this shows the characteristic keel. The Scotch specimen is very badly preserved: the strong median imbricated ridge is well seen, but the rest of the shell, though not crushed, is so encrusted by mineral matter that the surface of the valve is not to be made out. I know no figured shell except the North American species which has such a strongly marked and peculiarly ornamented median ridge.

TABLE SHOWING THE LAMELLIBRANCH FAUNA OF THE COAL MEASURES OF NEBRASKA, AND THE OCCURRENCE OF THE SAME SPECIES IN EUROPE.

	Nebraska.	Scotland.	Congleton Edge.	Hazel Hill.	Base of Bristol Coal Measures.	Russia.
Limatulina alternata, M'Coy, sp.,		×				
Palæolima retifera, Shumard,	×				×	
Entolium aviculatum, Swallow, sp.,	×					× ‡
Nucula Beyrichi, V. Schaur. ?	×					
,, *gibbosa*, Flem.,		×				
,, *ventricosa*, Hall,	×					
Yoldia subscitula, M. and H.,	×					
Nuculana lævistriata, M. and W., sp.,	×	×				
,, *attenuata*, Flem., sp.,		×				
Ctenodonta lævirostris, Portlock, sp.,		×				
Grammatodon tenuistriata, M. and W., sp.,	×	×			×	× *
Protoschizodus curtus, M. and W., sp.,	×	×				
Schizodus Wheeleri, Swallow, sp.,	×	×				× † ‡
Avicula longa, Geinitz,	×					
,, *? sulcata*, Geinitz,	×					
Pseudomonotis radialis, Phill., sp.,	×					× ‡
Myalina Swallovi, M'Chesney,	×					
,, *subquadrata*, Shumard,	×					
,, *perattenuata*, M. and W.,	×					
,, *Verneuillii*, M'Coy,		×				
Aviculopecten occidentalis, Shumard, sp.,	×					
,, *neglectus*, Geinitz, sp.,	×	×				
,, *carboniferus*, Stevens, sp.,	×		×	×		× ‡
,, *coxanus*, M. and W.,	×					
,, *obliquus*, sp. nov.,		×				
,, *regularis*, sp. nov.,		×				
Pterinopecten papyraceus, Sow., sp.,		×			×	
,, *Whitei*, Meek, sp.,	×	×				
Posidoniella lævis, Brown, sp.,		×	×		×	
Aviculopinna americana, Meek,	×					
Pinna peracuta, Shumard,	×					
Modiola ? subelliptica, Meek,	×					
Pleurophorus oblongus, Meek,	×					× ‡
Sanguinolites occidentalis, M. and H., sp.,	×	×				
Edmondia reflexa, Meek,	×	×				
,, *glabra*, Meek,	×					
,, *nebrascensis*, Geinitz, sp.,	×	×				× † ‡
,, *subtruncata*, Meek,	×					
,, *aspinwallensis*, Meek,	×					
,, *Lyellii*, Hind,		×				
,, *sulcata*, Phill., sp.,		×				
Allorisma reflexa, Meek,	×	×				
,, *Geinitzi*, Meek,	×					
,, *subelegans*, Meek,	×					
,, *granosa*, Shumard, sp.,	×					
,, *subcuneata*, M. and H.,	×					× ‡
Tellinomorpha Hindii, Bolton,		×			×	
Solenomorpha cylindrica, sp. nov.,		×				
Solenomya brevis, sp. nov.,		×				
,, *cylindrica*, sp. nov.,		×				
Prothyris elegans, Meek,	×	×				
Solenopsis solenoides, Geinitz., sp.,	×					

* Tschernyschew, "Obercarbonischen Brachiopoden d. Ural u. d. Timan," *Mém. Com. Géol. Russie*, 1902.

† Stuckenberg, "Die Fauna der obercarbon. Suite des Wolgadurbruches bei Samara," *Mém. Com. Géol. Russie*, 1905, Livr. 23.

‡ Jakowlew, "Die Fauna der oberen Abtheilung der Palaeozoischen Ablagerungen im Donetz Bassin: Die Lamellibranchiaten," *Mém. Com. Géol. Russie*, 1903.

APPENDIX.

Since completing and presenting my account of the lamellibranch fauna in the Millstone Grit in Scotland, the following specimens have been collected by the officers of the Geological Survey from the cores of the Plean Bore near Stirling.

Edmondia nebrascencis, Geinitz, sp., 1866. (Pl. II. fig. 34.)

Astarte nebrascencis, Geinitz, 1866, *Carb. und Dyas in Nebraska*, p. 16, Tab. i. fig. 25.
Edmondia? ,, Meek, 1872, *Fin. Rep. U.S. Geol. Surv. Nebraska*, p. 214, pl. x. fig. 8, *a*, *b*.
,, ,, Miller, 1889, *N. Amer. Geol. and Pal.*, p. 479.

Specific Characters.—Shell slightly transverse, subovate, only moderately gibbose, unequilateral. The anterior end is short, its margin regularly rounded. The inferior margin is broadly curved. The posterior border is bluntly rounded. The hinge line is slightly arcuate. The umbones are small, slightly elevated, placed at the junction of the anterior and middle thirds of the hinge line.

Interior.—Not yet examined.

Exterior.—The surface is ornamented by concentric, fine, raised, fairly equidistant linear ridges which separate moderately wide concentric sulci which are finely linear transversely. This marking is more characteristic in the new parts of the valve, towards the inferior margin; in the umbonal or juvenile part of the shell the lines and grooves are crowded. Under the microscope very fine radiating lines are seen.

Dimensions.—A right valve from Nebraska in my collection measures: antero-posteriorly, 22 mm.; dorso-ventrally, 17 mm.

Locality.—Stirlingshire, Sheet 24 N.W., Rosehill diamond bore, $1\frac{1}{2}$ mile E. of Plean.

Observations.—Some half-dozen specimens of this species have been obtained from the diamond bore at Rosehill. *E. nebrascensis* is very closely related to *E. M'Coyii*, Hind, but it has some slight differences in the ornament. The concentric lines are more sharply linear and finer, especially in the older part of the shell, and in one specimen I made out the radiating markings mentioned by MEEK in his species. In general shape there is no real difference between the species, and they are very closely allied, but *E. M'Coyii* is the more gibbose of the two. I have a series of fine specimens from Nebraska, and have been able to compare these with the Scotch examples and the series of shells which served me for the study of my species *E. M'Coyii*. Unfortunately the Scotch examples are very badly preserved; but specimens $T^{4\,6\,4\,3B}_{4\,6\,4\,4B}$?, Pl. II. fig. 34, show the characteristic marking of the valve. The series from Rosehill show a greater tendency to variation of the ornament in the older and younger portions of the shell than my American series. *Sanguinolites occidentalis* occurs in the Shale with *E. nebrascensis*.

EXPLANATION OF PLATES.

PLATE I.

Fig. 1. *Palæolima retifera*, Shumard, sp. × 3/2. Page 337.
Figs. 2, 3. *Aviculopecten regularis*, sp. nov. × 3/2. Page 341.
Figs. 4–6. *Aviculopecten neglectus*, Geinitz, sp. × 2. Page 341.
Fig. 7. „ „ „ 4. Page 341.
Fig. 8. *Aviculopecten obliquus*, sp. nov. × 2. Page 340.
Figs. 9, 10. *Limatulina alternata*, M'Coy, sp. Page 338.
Figs. 11, 12. *Aviculopecten Whitei*, Meek, right and left valves. Page 338.
Fig. 13. „ „ × 3/2. Page 338.
Fig. 14*. *Aviculopecten carboniferus*, Stevens, sp. × 3/2. Page 339.
Fig. 15. *Posidoniella lævis*, Brown, sp., a left valve. × 3. Page 342.
Fig. 16. *Myalina Verneuillii*, M'Coy, sp. Page 342.
Fig. 17. *Nuculana lævistriata*, Meek and Worthen, sp. × 3/2. Page 343.
Figs. 18, 19. *Nucula gibbosa*, Flem. × 4 Page 343.
Fig. 20. *Modiola subelliptica*, Meek. × 3. Page 343.
Fig. 21. *Grammatodon tenuistriata*, Meek and Worthen, sp. × 21. Page 344.
Figs. 22, 23. *Protoschizodus curtus*, Meek and Worthen, sp. × 3/2. Page 345.
Figs. 25–28. *Schizodus Wheeleri*, Swallow, sp. Page 345.
Figs. 29, 30. ? *Anthracomya truncata*, sp. nov. Page 346.

All specimens are from Scotland, and in the Museum of the Geological Survey of Scotland, with the exception of *. This specimen is from Pately Bridge, Yorkshire, and is in the Collection of the Geological Survey, Jermyn St.

PLATE II.

Figs. 31, 32. *Edmondia excentrica*, sp. nov. Page 347.
Figs. 33. „ *sulcata*, Phillips, sp. Page 348.
Fig. 34. „ *nebrascensis*, Geinitz, sp. Page 358.
Fig. 35. „ *Lyelli*, Hind. Page 348.
Figs. 36–38. *Sanguinolites occidentalis*, Meek and Hayden, sp. Page 348.
Fig. 39. ? *Allorisma reflexa*, Meek. Page 349.
Figs. 40–42. *Tellinomorpha Hindii*, Bolton. × 3/2. Page 349.
Figs. 43, 44. *Solenomorpha cylindrica*, sp. nov. × 3. Page 350.
Fig. 45–47. *Solenomya brevis*, sp. nov. Figs. 45 and 47 × 2. Page 351.
Figs. 48–50. *Prothyris elegans*, Meek. × 3/2. Page 353.
Fig. 51. *Loxonema nanum*, de Koninck. × 3. Page 353.
Figs. 52, 53. *Naticopsis brevispira*, de Ryckholt, sp. × 3. Page 354.
Fig. 54. *Entalis Meekianum*, Geinitz, sp. × 3/2. Page 355.
Fig. 55. *Ptychomphalus Marcouianus*, Geinitz, sp. × 2. Page 354.
Fig. 56. *Bellerophon Marcouianus*, Geinitz. × 3/2. Page 356.
Figs. 57, 58. *Euphemus d'Orbignyi*, Portlock, sp. × 3/2. Page 355.
Fig. 59. *Macrocheilina*, sp. Page 354.
Figs. 60, 61. *Solenomya cylindrica*, sp. nov. Page 351.

All the figured specimens are from Scotland, and are in the Museum of the Geological Survey of Scotland.

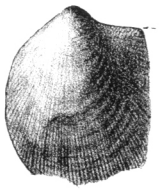
1 × 3/2.

2 × 3/2.

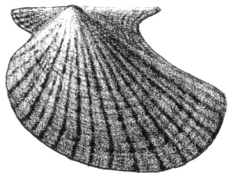
3 × 3/2.

4 × 2/1.

5 × 2/1.



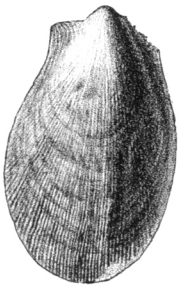
9.



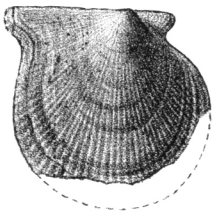
8 × 2/1.

6 × 2/1.

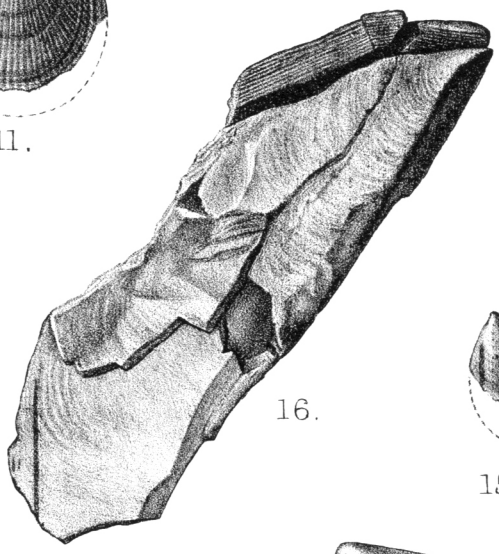
7 × 4/1.



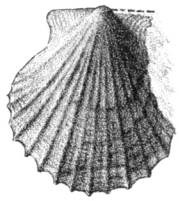
10.



11.

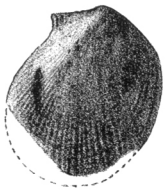


16.



14 × 3/2.

13 × 3/2.



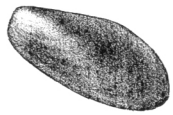
12.

15 × 3/1.

17 × 3/2.

18 × 4/1.

19 × 4/1.



20 × 3/1.

21 × 2/1.

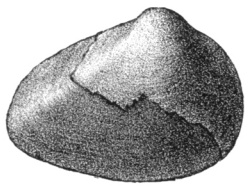
22 × 3/2.

23 × 3/2.

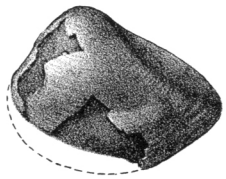
25.

26 × 3/1.

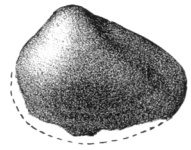
29 × 3/1.



24.



27.

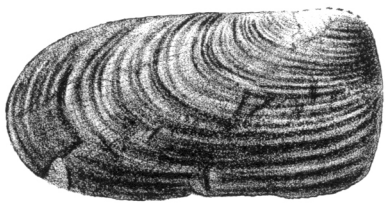


28.

30 × 3/1.

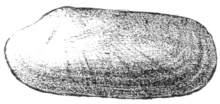
31 × 3/2.

32 × 3/2.



33.

34.



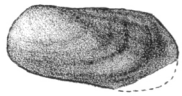
60 × 3/2.

61 × 3/2.

35.

36.

37.



38.

40 × 3/2.

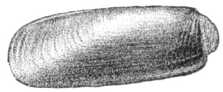
43 × 2/1.

44 × 2/1.

39 × 3/2.

41 × 3/2.

42 × 3/2.

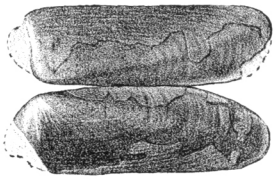


48 × 3/2.

45 × 2/1.

46.

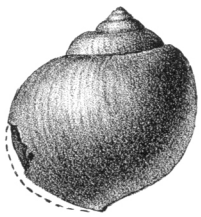
47 × 2/1.



49 × 3/2.

50 × 3/2.

51 × 5/1.

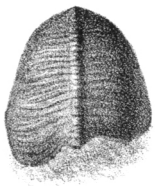


52 × 5/1.

53 × 5/1.

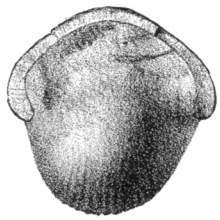
54 × 3/2.

55 × 2/1.

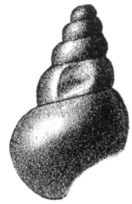


56 × 3/2.

57 × 3/2.



58 × 3/2.



59 × 3/1.

A. H. Searle del. et lith.