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Some Fossils from an Outcrop in Des Moines

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SOME FOSSILS FROM AN OUTCROP IN DES MOINES

A. O. THOMAS

At the time of the meeting of the Iowa Academy of Science at Drake University, Des Moines, in April, 1922, the writer accompanied by Mr. Ben Hur Wilson made a brief visit to the clay pit of the Capital City Clay Company. This pit is located along the Chicago Great Western railroad tracks south of Raccoon river in the city of Des Moines and while perhaps the most extensive, is typical of similar exposures in the city. About thirty-five to forty feet of bluish shale and a few thin beds of sandstone and sandy shale are exposed and worked for the clay used in making brick and tile and other products. One stratum fifteen or eighteen inches thick is more resistant than others in the pit and when fresh is hard and gritty. Blocks from this bed are rejected and piled up as refuse here and there in the pit. Upon exposure to the weather the blocks crumble more or less and the loose waste from them contains many well preserved fossils while others stand out in relief on the surfaces of the partly weathered blocks.

The beds belong to the Henrietta formation of the Des Moines stage of the Coal Measures and the fossils found are fairly typical of that horizon. Many of the fossils, especially the brachiopods, are crushed, some of them quite flat. As a result it has been difficult to obtain good specimens of some species. In spite of this fact scores of good specimens were obtained in an hour's search. Some weeks later Mr. Wilson visited the pit again and sent in a supplementary lot, among which were parts of a trilobite, additional spiniferous crinoid plates, and several brachiopods. These two lots together with a number obtained by Mr. Wilson at a time previous to the writer's visit comprise the available material. Doubtless careful and systematic collecting over a period of years will add several species not mentioned in this paper.

Small but occasionally very perfect crystals of selenite occur in the shale. This mineral is transparent in thin pieces, soft enough to be scratched by the thumb nail, and cleaves readily parallel to the side faces of the crystals. Its composition is the same as that of gypsum, namely, hydrous calcium sulphate.

It is hoped that the brief descriptions and illustrations which follow may prove helpful to local teachers, students, and collectors, at the request of some of whom this little task was undertaken.

DESCRIPTION OF THE FOSSILS

FORAMINIFERA.

Fusulina cylindrica Fischer

Plate 1, fig. 1.

Small spindle-shaped objects about the size and shape of grains of rye or wheat. A section at right angles to the long axis when examined with a lens shows the spiral arrangement of the convolutions as well as the small partitions which divide each "grain" into numerous small chambers. A weathered specimen often shows the internal features quite as well as if cut or polished.

Specimens rather rare at the clay pit but a few were found clinging to corals and to other fossils. In places in the Coal Measure beds of south-western Iowa these lime-secreting protozoa must have lived by the millions for their remains are so abundant that they may be gathered by the handful. *Fusulinas* are characteristic fossils of the Carboniferous rocks all over the world.

CORALS.

Lophophyllum profundum Ed. and H.

Plate 1, figs. 2-7.

A simple, slender, straight or slightly curved conical coral, marked on the outside by conspicuous septal ridges, and by occasional wrinkles or rings of growth. The walls of the cup are so thin that on most specimens they have been broken off leaving only that part of the coral that was present below the bottom of the cup. In some cases the walls are crushed together but still attached at one side; such specimens show that the cup was quite deep, its depth in some cases equalling fully one-half the total length of the coral. A few individuals exhibit short rootlike processes near the point.

The septa are of two sizes, long ones which reach to the center and very short ones alternating with them. There are twenty to thirty of each, the number differing according to the size of the coral. In the center of each coral is a peglike structure called the columella. Its upper end extends above the floor of the cup as a sharp wedge-shaped projection and it is variously decorated by a series of straight or winding grooves and ridges. Polished cross-sections show that the longer septa do not reach the columella but are attached to it by a secondary deposit of lime. They also show thin plates which at intervals extend from septum to septum.

Occasional specimens show a new coral growing out of the cup of the old. Fairly common at the clay pit.

CRINOIDS.

Crinoid stems

Segments of crinoid stems are quite common among the fossils. They are all round or oval and vary from two or three to sixteen millimeters in

diameter. Most of the specimens have flat-edged segments but in a few the edges of the segments are rounded. The appearance of the joint faces can be made out from the figures on the accompanying plate. The segments which bear cirri are thicker than those above or below them.

Crinoid plates

Loose plates of various sizes and shapes are fairly common among the smaller fossils. Except for the spine-bearing plates described below they are hard to identify. One large plate compares very well with a radial plate from the cup of *Hydreionocrinus patulus* Girty illustrated in Bulletin 544 published by the United States Geological Survey.

1. *Delocrinus* sp. undet.

Plate 1, figs. 8-11.

A number of stout plates terminating in long gradually tapering pointed spines occur in the collection. They are thought to be first brachial plates. On the upper side and near the base is a triangular area more or less sharply delimited from the remainder of the surface; a strongly elevated ridge arises at the distal apex and divides the triangle into two parts; the ridge ends proximally just above a V-shaped notch at the center of the base. At its terminus the ridge is marked by a short transverse process. Near the center of each side of the triangle and parallel to its edge is an elongate narrow ligament pit. The surface of the triangular area between this pit and the base of the ridge is depressed and the depression is flanked on either side by a very low ridge. These low ridges converge proximally. The end of the plate is transversely concave. Seen from below the body of the plate is broadly rounded and thick. The specimens at hand average one inch in length and belonged to a large calyx.

1. *Delocrinus* sp. undet.

Plate I, figs. 12-15.

The plates referred to this genus terminate in sharp flattened points while the inner ends are broad and bounded by straight sutural edges. The broad shovel-shaped inner end is quite flat on one side but is thickened along its proximal margin on the other. This raised portion is marked by a series of grooves and sinuous ridges. A shallow groove runs longitudinally along the center of the lateral facets. When in position in the calyx these outer facets were evidently in contact and made a cycle of ten or twelve or more spiny plates at some level in the calyx or ventral sac.

SEA URCHINS OR ECHINOIDS.

Archeocidaris sp. undet.

Plate 1, fig. 26.

A single six-sided plate from an interambulacral area represents all that was found. The plate shows the perforate mamelon, the basal terrace, and a broad scrobicular area. The scrobicular ring is nearly marginal.

Plates and spines of this genus are widely scattered throughout Coal Measure rocks of Iowa and adjoining states but whole specimens made up of hundreds of plates are decidedly rare.

WORMS.

Serpulopsis insita (White)

Plate 2, fig. 8.

This worm built slender threadlike tubes of lime which are attached to shells of brachiopods and other organisms. A specimen a few millimeters long is attached to the interior of a valve of *Chonetes mesolobus* in the collection. Others were observed on the shells of other brachiopods.

BRYOZOA.

These delicate fossils are quite abundant in all the blocks examined. There are no doubt several other species not recognized by the collectors. Superficially they are very similar to each other and must be carefully studied with a good lens in order to distinguish the different forms.

Fistulipora nodulifera Meek

Plate 1, fig. 25.

Massive colonies of irregular or nodose shape growing free or attached to bits of other bryozoa, crinoid stems, or some other organism. Zoëcia round and separated by the same as or somewhat less than their own diameter. Each zoëcium is surrounded by a sharply elevated lip which extends about half way around, imparting to each opening a sublunate appearance especially on the unworn parts of a colony. Specimens of this bryozoan found at the clay pit are smaller than those usually found elsewhere. The species is fairly common throughout the Coal Measures of Iowa, Nebraska and adjoining states.

Polypora cf. elliptica Rogers

Plate 1, figs. 22-24.

Species represented by bits of the frond showing three or four rows of zoëcia on the celluliferous side. The cross-bars or dissepiments are narrower than the branches and are free of cells. Fenestrules elliptical to subquadrate. Faint undulating ridges separate the zoëcia, which are small and round and distant from each other longitudinally by more than their own diameters. On the reverse side the branches and dissepiments are on the same level in most cases. At intervals there rise from the branches strong spine bases. They are fully as strong as the branches and stand vertical to the surface.

The specimens at hand compare very well with *P. elliptica* except for the strong spines on the reverse side, which are not mentioned in descriptions of that species.

Rhombopora lepidodendroides Meek

Plate 1, figs. 18, 19.

Slender branching stems, approximately circular in cross section, one-half to one and one-half millimeter in diameter. Bifurcations occurring at irregular intervals, between which the stem is straight. Zoëcia rounded or subpolygonal, arranged in spiral rows about the stems like the scars on the trunk of a *Lepidodendron* tree. On fresh unworn surfaces, presumably of young branches, the apertures are surrounded by a row of low

monticules arranged in a rhombic design with a more or less prominent node at each corner. Longitudinally there are twenty to twenty-four openings in ten millimeters,

This little bryozoan is one of the commonest fossils at the clay pit.

Streblotrypa prisca (Gabb and Horn)

Plate I, fig. 20.

Slender cylindrical stems branching at irregular intervals; diameter scarcely reaching one millimeter. Zoëcia arranged in longitudinal rows and having a more or less spiral plan as well. Each zoëcium is located at the upper end of a depression which is surrounded by a low winding ridge. Apparently six small pits or mesopores in each depression below the oval zoëcium; these pits are arranged in two rows.

This species is rare at the clay pit and moreover is readily confused with *Rhombopora lepidodendroides*, from which it differs in being more slender, in the less apparent spiral arrangement of the cells, and in the presence of mesopores in the same depression with the zoëcia.

BRACHIOPODS.

Crania modesta White and St. John

Plate II, fig. 29.

This little brachiopod has a round or nearly round shell. It had the habit of attaching itself by the entire surface of one valve to some other form. The hosts on which it was observed are *Lophophyllum profundum*, spiny plates of *Delocrinus*, and *Composita subtilita*. Two or more occur as a rule on the same host. In many cases the attached or pedicle valve alone remains. This valve is very thin, so much so that the irregularities of the surface of the host are readily seen except at the position of the muscle scars, which, together with the valve's border, are thickened and elevated above the general surface. The free or brachial valve is subconical in shape. It is smooth except for a few growth lines near the margin. The apex is slightly subcentral, pointed, and directed toward the nearest part of the margin. This description of the upper valve is based on White and St. John's type from Fremont county and which is in the University of Iowa collections. In the type both valves are present and they are free from any host. Their combined marginal thickness is between 1 and 1.5 millimeter while centrally they are thin enough to be translucent, but the latter condition is emphasized by the fact that the apical part of the concave lower valve is apparently broken away.

Height of type 2.6 mm., greatest diameter 7.6 mm., and least diameter 6.8 mm.

Derbya crassa Meek and Hayden

Plate II, fig. 18.

Only fragmentary parts of this fine species were found in the clay pit. These indicate smaller individuals than usually represent the species at localities where they are well preserved.

Shell subcircular, with straight hinge-line. Like some other strophomenoids there is not much space between the valves.

The pedicle valve is the more convex, its beak is small, the area is low

and not as long as the greatest width of the shell. The foot opening is closed by a false deltidium which is triangular in shape, higher than wide, and is a little elevated above the nearly flat area. The brachial valve is quite flat or but very moderately convex.

Both valves are marked by nodose prominent ribs separated by flat interspaces. The surface is crossed by concentric growth lines and in addition is frequently wavy and more or less distorted. Separate valves show muscle scars, hinge teeth and other features of the interior.

Chonetes mesolobus Norwood and Pratten

Plate II, figs. 7-12.

Shell small, wider than long and distinguished by a prominent fold along the middle of the pedicle valve. The cardinal area is narrow. Three or four outwardly directed spine bases adorn the edge of the convex pedicle valve on either side of the beak. Brachial valve concave and bearing a median depression corresponding to the median lobe of the pedicle. Surface of both valves marked by very fine radiating striæ.

This little shell and the next are very common and beautifully preserved at the clay pit. They are very typical and widespread Coal Measures fossils.

Chonetes verneuillianus N. and P.

Plate II, figs. 1-6.

Shell small, but averaging larger than *C. mesolobus*, wider than long, and tending to be extended along the hinge-line. A few blunt spine bases are present along the cardinal margin. The pedicle valve is marked by a deep, broad sinus which is expressed as a low fold on the opposite valve. Surface marked by fine radiating striæ.

This common little shell is distinguished from the last by its bilobed appearance and longer hinge-line.

Productus semireticulatus (Martin)

Plate II, fig. 13.

A large brachiopod with highly convex pedicle valve, concave brachial, narrow cardinal area, straight hinge-line, and with extended cardinal-lateral angles giving the shell an "eared" appearance. Spines few, stout and scattered, being most abundant on the ears near the hinge-line. The half of each valve nearest the hinge is crossed by concentric wrinkles in addition to the radiating striæ which cover the entire shell, thus giving it a semireticulated appearance, whence the name. A broad shallow sinus on the ventral valve imparts a bilobed aspect to the shell.

The large spines of this species, 10 to 15 mm. or more in length, are scattered throughout the shale. Common at the clay pit but in most cases the specimens are crushed and broken. Well represented in the Coal Measures throughout the world.

Productus (Marginifera) muricatus N. and P.

Plate II, figs. 14, 15.

A small shell, wider than long, nearly semicircular in shape. Hinge-line about equal to greatest width of the shell.

Pedicle valve convex, its beak and ears small. Surface marked by prominent costæ, by concentric wrinkles, and by spines. All these features are most apparent on the anterior half and on the marginal parts of the valve.

Brachial valve deeply concave leaving but little room between the two valves. The markings are quite similar to those of the opposite valve except that the spines are fewer and apparently smaller.

The fine spines of this species are scattered all through the fossiliferous layers of the pit. Perfect specimens of this species are not common but it is abundantly represented by incomplete material.

***Spirifer cameratus* Morton**

Plate II, figs. 31-33.

A very common shell in the Coal Measures of Iowa and widely distributed in rocks of this age throughout North America.

Medium size, broadest at hinge-line and pointed at cardinal angles when well preserved. Pedicle valve with well marked sinus extending from the strongly incurved beak to the front margin. Cardinal area concave and striated. Brachial valve with distinct fold. Surface of fold and sinus as well as rest of shell covered with strong costæ which tend to be arranged in bundles.

***Squamularia perplexa* (McChesney)**

Plate II, figs. 22, 24, 25.

Shell small, width and length of variable relation but in many cases nearly equal, subcircular or in a few cases subquadrate in outline. Shell usually thick, even gibbous, convexity of the two valves nearly equal, the pedicle tending to be the greater in case of difference. Umbonal parts of each valve prominent. Cardinal area small and practically hidden by the incurving beaks in the specimens at hand.

Both valves marked by concentric ridges, unequally spaced and bearing a growth of fine overlapping spines. These are often crowded, especially along the marginal part of the shell, and give it a scaly or squamose appearance. On occasional shells the spines are double-barreled.

A few shells have lost all the spines; these are easily confused with young shells of *Composita subtilita* but they lack the sharply elevated concentric marks and moreover the latter has a terminal pedicle opening in the beak.

***Spiriferina kentuckiensis* (Shumard)**

Plate II, figs. 16, 17.

A small shell with pointed cardinal angles. Fold and sinus simple, the fold larger than any of the lateral plications and the sinus deeper than any of the depressions between them. Five to eight strong simple plications on each half of the valves. The cardinal area of the pedicle valve small but distinct, that of the brachial very narrow. Surface marked by crowded lamellose ridges which cross the plications and the spaces between them alike.

Fairly common at the clay pit and widely distributed in Coal Measures of North America.

Hustedia mormoni (Marcou)

Plate II, figs. 19-21, 26, 27.

A small shell, both valves rounded or gibbous. Beak of pedicle valve protruding and terminating in a round foot opening, below which in well preserved shells is a small triangular area. Fourteen to seventeen simple, radiating ribs on each valve.

This shell is common at the clay pit but every specimen seen is so compressed as to be quite flat. It is a fairly common species in beds of this age in central and western United States.

Composita subtilita (Hall)

Plate II, figs. 23, 28-30.

Shell suboval, longer than wide, but in young forms length and width may be nearly equal. Pedicle valve a little more convex than the brachial, its beak prominent and ending in a perforation for the foot. The very slight and shallow sinus over the posterior part of the valve widens and deepens toward the front. Brachial valve with poorly defined fold. Surface of both valves quite smooth except for impressed concentric growth lines.

Adult shells reach a length of twenty-five to thirty millimeters. Fairly common at the clay pit and widely distributed in the Coal Measures of North America. Its smooth surface made it a favorite resting place for *Crania* and *Serpulopsis* described above.

TRILOBITES.

Griffithides scitulus Meek and Worthen

Plate II, fig. 38.

Separate fragments of this trilobite are rare in the clay pit. It is a small species with long cheek spines that reach back nearly to the middle of the thorax. When complete it has thirteen thoracic segments or divisions of the thorax.

The parts found at the clay pit are represented by (a) a granular, more or less four-sided glabella, (b) free cheeks with small but distinct eyes and very long backwardly pointed cheek spines, and (c) pygidia or tail shields. The latter pieces are the commonest parts found chiefly because they are larger than the others. A pygidium is rounded triangular in shape, its axis, or median lobe, is strongly elevated both along the sides and at its posterior extremity. The sides of the axis are nearly vertical and it is flattened above; it bears thirteen nodose rings or annulations. The lateral slopes of the pygidium are flat above for about half their width whence they drop off abruptly to the smooth margin. At the bend there is a conspicuous node on each of the six ribs.

This species is among the last of the trilobites. They disappeared forever soon after the deposition of the Coal Measure rocks.

FISHES.

Teeth and possible dermal scales of this class of animals are fairly common in Coal Measures rocks. Those found at the clay pit are shiny jet

black in color and are a conspicuous though not abundant part of the fauna.

Petrodus occidentalis Newberry and Worthen

Plate II, figs. 35-37.

A cone-shaped tooth rising from a subcircular base. Apex of cone smooth, its flanks marked by a number of radiating grooves of different lengths, the longer ones being the deeper. The grooves are separated by sharp ridges which are serrated by a row of blunt denticles.

The base is shallowly concave centrally, and its surface is pitted by small circular pits. Peripherally the base extends for a short distance beyond the lower ends of the divergent ridges. Its edge is sharp and thin when well preserved.

Many years ago Professor Agassiz suggested that these objects are not teeth but tubercles from the skin of some ancient shark. Indeed some of the modern sting rays have similar dermal structures and it is difficult to see how these objects with so thin a base could have been of much service in mastication. However, we do not attempt to settle in this paper whether they are teeth or scales.

A typical specimen is 6.4 mm. high and between 9.0 and 10.0 mm. in diameter at the base. Specimens of much less than half these dimensions occur also.

Orodus corrugatus N. and W.

Plate II, fig. 34.

An incomplete tooth found at the clay pit is referred with some doubt to this species. The fragment is 12 mm. long, 8.2 mm. across the wider end, 5.1 mm. across the narrower end, and about 3.3 mm. thick except at the wider end and where it is considerably thicker. The surface is marked by a complicated maze of grooves, ridges and pits. One edge is sharp and crenulated and the sides of the sharp edge are marked by denticulate ridges between which the depressions are glossy and smooth.

This and the last are widely distributed throughout the Coal Measures of Iowa and neighboring states.

PALEONTOLOGICAL LABORATORIES,
STATE UNIVERSITY OF IOWA.

PLATE I

- Fig. 1. *Fusulina cylindrica* Fischer.
A cluster of individuals clinging together. This lot from southwestern Iowa.
- Figs. 2-7. *Lophophyllum profundum* Edwards and Haime.
2, 3. Two views from opposite sides of a specimen whose calyx walls are crushed together.
4, 5, 7. Slender but typical individuals; the upper part of number 4 has budded out of an older calyx. Note the peg in the cup and the tendency to bear "roots" near the tip.
6. A short stocky calyx.
- Figs. 8-11. *Delocrinus* (species undetermined).
Upper and lower views of two specimens of the spiny first brachial plates.
- Figs. 12-15. *Hydreionocrinus* (species undetermined).
12, 13. Ventral and dorsal views of same plate.
14, 15. Ventral views of two typical plates.
- Figs. 16, 17. Crinoid stems, showing range in size, thickness of the segments, the pentalobate axial canal, and other features.
- Figs. 18, 19. *Rhombopora lepidodendroides* Meek.
Five fragments, a little over one and one-half times natural size, showing mode of branching and arrangement of the zoëcia.
- Fig. 20. *Streblotrypa prisca* (Gabb and Horn).
A bit of a branching colony, enlarged.
- Fig. 21. Bit of shell of the brachiopod *Productus* showing the spines.
- Figs. 22-24. *Polypora* cf. *elliptica* Rogers.
Pieces of the frond enlarged about one and one-half diameters. Figure 24 is the celluliferous side of figure 22.
- Fig. 25. *Fistulipora nodulifera* Meek.
A small colony natural size.
- Fig. 26. *Archaeocidaris* (species undetermined).
Six-sided interambulacral plate attached to crushed shells of *Hustedia mormoni*, enlarged one and one-half diameters.

Thomas: Some Fossils from an Outcrop in Des Moines

IOWA ACADEMY OF SCIENCE

PLATE I

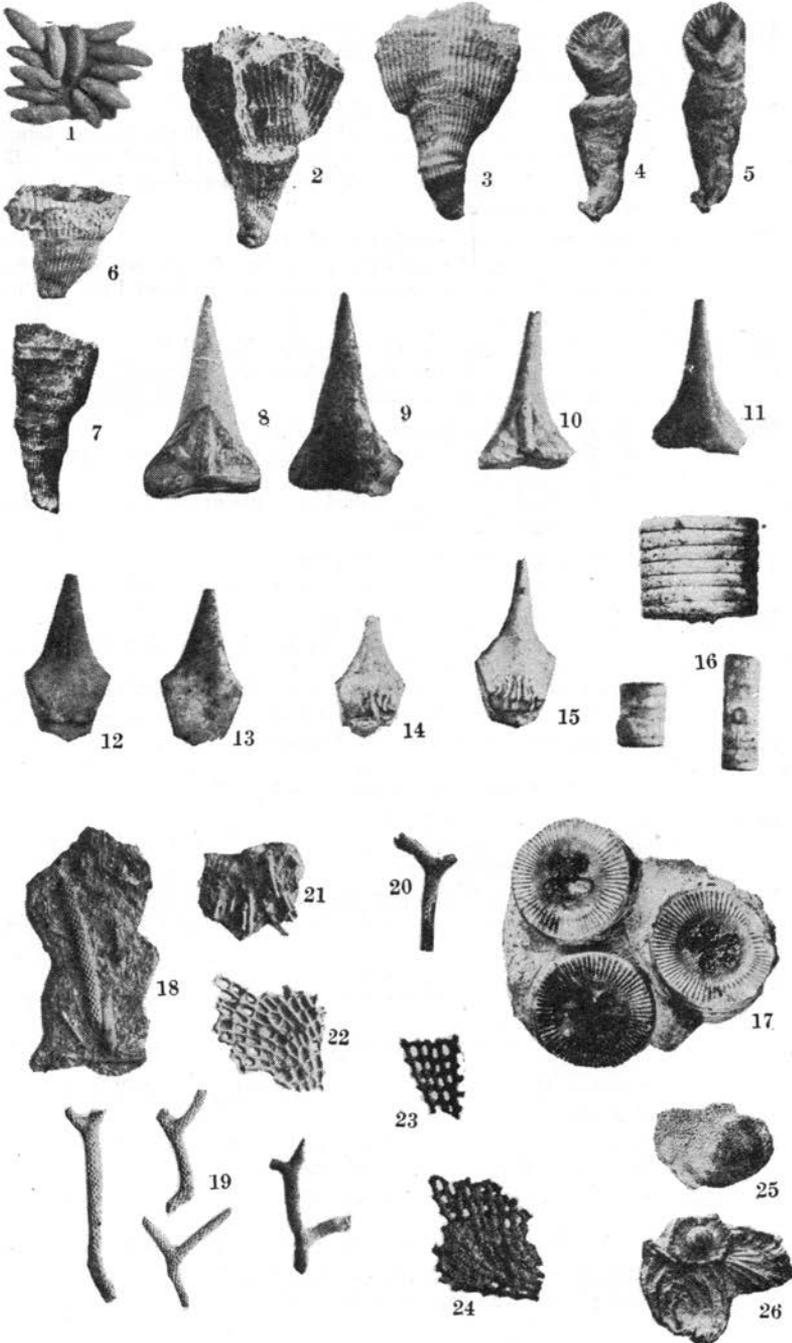


PLATE II

- Figs. 1-6. *Chonetes verneuillianus* N. and P.
Enlarged one and one-half diameters. Figure 5 shows interior of a brachial valve.
- Figs. 7-12. *Chonetes mcisolobus* N. and P.
7, 10, 11 are ventral views which show well the median lobe. 8, 9 are interiors of brachial valves. 12 is a dorsal view. All are X1.5. An example of *Serpulopsis insita* may be seen on left side of figure 8.
- Fig. 13. *Productus semireticulatus* (Martin).
Shell lacks part of right cardinal angle. Note bases of spines and the absence of concentric lines on the front half of the shell.
- Figs. 14, 15. *Productus (Marginifera) muricatus* N. and P.
Ventral views of two shells. Note the bases of the small spines and the type of marking.
- Figs. 16, 17. *Spiriferina kentuckiensis* (Shumard).
16. Interior of a brachial valve showing the crura and the strong plications.
17. Brachial view of a crushed example preserving the markings. Enlarged 1.5 times.
- Fig. 18. *Derbya crassa* Meek and Hayden.
Brachial valve of a very fine specimen from Warren county.
- Figs. 19-21, 26, 27. *Hustedia mormoni* (Marcou).
19-21, two brachial views and one pedicle view of typical specimens from southwestern Iowa.
26, a pedicle, and 27, a lateral view of two imperfect individuals from the clay pit. These two are enlarged.
- Figs. 22, 24, 25. *Squamularia perplexa* (McChesney).
A number of typical specimens one or two of which show the concentric ridges and the rows of spines.
- Figs. 23, 28-30. *Composita subtilita* (Hall).
Side views and pedicle view of three individuals. Number 28 is from Madison county.
- Fig. 29. *Crania modesta* White and St. John.
Two ventral valves attached to a specimen of *Composita subtilita*.
- Figs. 31-33. *Spirifer cameratus* Morton.
Number 31 is a rostral portion of the pedicle valve showing strong dental plates.
Number 32 is a brachial view of a perfect specimen from Winterset.
Number 33 is a ventral view of an imperfect shell from the clay pit.
- Fig. 34. *Orodus corrugatus* Newberry and Worthen.
Incomplete platelike tooth showing markings.
- Figs. 35-37. *Petrodus occidentalis* N. and W.
36, lateral view.
35, 37, apical views of two others showing range in size.
- Fig. 38. *Griffithides scitulus* Meek and Worthen.
Tail shield of an average individual.

