THE FORAMINIFERA OF THE MINT SPRING CALCAREOUS MARL MEMBER OF THE MARIANNA LIMESTONE.

By JOSEPH A. CUSHMAN.

INTRODUCTION.

The Mint Spring calcareous marl member of the Marianna limestone, a lower Oligocene series of beds of the Coastal Plain region, was defined by C. Wythe Cooke[1] as follows:

> The "chimney rock" facies of the Marianna limestone is replaced in western Mississippi by sands and shell marls for which the name Mint Spring calcareous marl is here proposed. The name is derived from Mint Spring Bayou, a small stream entering Centennial Lake just south of the National Cemetery at Vicksburg. The strata to which the name is applied are exposed beneath a waterfall in the lower course of the stream.
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> Between Vicksburg and Pearl River the Mint Spring marl occupies the entire interval between the Forest Hill sand and the Glendon limestone, but east of Pearl River it is overlain by a thickening wedge of the Marianna "chimney rock." It has not been recognized east of Chickasawhay River, on which it is exposed 1¼ miles northwest of the mouth of Limestone Creek. Other important exposures are along Glass Bayou at Vicksburg and at Haynes Bluff, 14 miles north of Vicksburg, where it is 25 feet thick.

The type station may be taken as U. S. G. S. station 6452, shell and sand bed at foot of high waterfall, Mint Spring Bayou, Vicksburg, Miss.; C. W. Cooke, collector.

The other stations represented in the collections here described are as follows:

6451. Same locality as station 6452; E. N. Lowe and C. W. Cooke, collectors.

6447, 6448. Foot of a high waterfall in Glass Bayou, near Vicksburg, Miss.

6647. Chickasawhay River 1¼ miles northwest of Limestone Creek, 4 miles northwest of Waynesboro, and 1¼ miles southwest of Boice, Wayne County, Miss.; C. W. Cooke, collector.

7671. "Brown's Cave," east bluff of Leaf River half a mile above the bridge on Bay Springs-Raleigh road, in sec. 13, T. 2 N., R. 8 E., Smith County, Miss.; C. W. Cooke, collector.

The distribution of the species at these stations and of those species which also occur in the younger Byram calcareous marl at its type station is indicated in the accompanying table.

As noted in my paper on the Byram marl,[2] many of the species are closely related to those now found living in the Indo-Pacific region. An added example of this relation is *Spirillina limbata* H. B. Brady var. *bipunctata* Cushman, n. var., which is a variety in the Mint Spring marl of a species that is characteristic of the Indo-Pacific.

The fauna evidently represents more than a shoal-water deposit, as it lacks certain of the genera present in the Byram marl which indicate shallow water and has a greater abundance of species which indicate deeper water. The occurrence of numerous Lagenidae indicates a depth of perhaps 50 fathoms, and the lack of such genera as *Heterostegina*, *Operculina*, and *Amphistegina* indicates a depth of more than 20 or 30 fathoms. This statement is based on data obtained from a study of Foraminifera in the Tortugas region in the Gulf of Mexico as well as of their distribution in the Philippine region.

A systematic treatment of the species follows.

[1] Washington Acad. Sci. Jour., vol. 8, No. 7, p. 195, 1918.

[2] U. S. Geol. Survey Prof. Paper 129-E, 1922.

Distribution of Foraminifera of the Mint Spring marl and Byram marl.

	Mint Spring marl.						Byram marl.
	6452	6451	6447	6448	6647	7671	6455
Textularia tumidulum Cushman	×	×	×	×		×	×
mississippiensis Cushman	×	×	×	×	×	×	×
subhauerii Cushman					×		×
Bolivina cf. B. punctata D'Orbigny		×					
cookei Cushman, n. sp			×		×	×	
vicksburgensis Cushman, n. sp		×					
frondea Cushman, n. sp					×		
Verneuilina rectimargo Cushman, n. sp	×	×	×	×			
Gaudryina triangularis Cushman						×	
sp. ?		×					
Bulimina pupoides D'Orbigny					×	×	
Buliminella subteres H. B. Brady var. angusta Cushman, n. var	×		×		×	×	
contraria (Reuss)					×		
Cassidulina crassa D'Orbigny		×	×				
Lagena laevigata (Reuss)		×					
striata (D'Orbigny) var. substriata Williamson						×	
orbignyana (Seguenza) var. flintii Cushman, n. var.			×				
hexagona (Williamson)	×						
Nodosaria communis D'Orbigny		×				×	
filiformis D'Orbigny				×		×	
obliqua (Linnaeus)	×				×	×	?
sp. ?						×	
Cristellaria convergens Bornemann					×	×	
cultrata (Montfort)						×	
rotulata (Lamarck)						×	
vicksburgensis Cushman, n. sp					×	×	×
Vaginulina legumen (Linnaeus) var. elegans (D'Orbigny)			×				×
Polymorphina byramensis Cushman	×	×	×	×	×	×	×
regina H. B. Brady, Parker, and Jones	×			×		×	×
problema D'Orbigny	×				×	×	×
gibba D'Orbigny		×	×		×	×	×
amygdaloides Reuss?	×	×	×	×		×	×
equalis D'Orbigny		×		×			
advena Cushman, n. sp		×					
cuspidata H. B. Brady			×				
var. costulata Cushman, n. sp	×						
vicksburgensis Cushman, n. sp		×		×			
spinosa (D'Orbigny)		×	×		×	×	
Uvigerina byramensis Cushman	×	×	×		×	×	×
pigmea D'Orbigny	×		×		×	×	
Globigerina bulloides D'Orbigny	×	×	×			×	×
dutertrei D'Orbigny		×			×	×	
Spirillina limbata H. B. Brady var. bipunctata Cushman, n. var	×	×	×		×	×	
Patellina advena Cushman, n. sp	×						
Discorbis auracana (D'Orbigny)			×				
bertheloti (D'Orbigny)	×	×					
Truncatulina lobatula (Walker and Jacob)	×	×		×	×	×	×
byramensis Cushman	×	×	×	×			×
americana Cushman, var	×	×	×	×			×
pseudoungeriana Cushman		×	×		×	×	×
vicksburgensis Cushman, n. sp				×			
Anomalina bilateralis Cushman		×		×	×	×	×
mississippiensis Cushman	×	×	×	×	×	×	×
vicksburgensis Cushman, n. sp	×						
Siphonia advena Cushman	×	×	×	×	×	×	×
Gypsina rubra (D'Orbigny)	×				×	×	×
Pulvinulina byramensis Cushman	×	×	×	×	×	×	×
glabrata Cushman	×	×		×		×	×
Rotalia byramensis Cushman			×	×			×
dentata Parker and Jones var. parva Cushman, n. var	×	×	×	×			
vicksburgensis Cushman, n. sp	×	×		×	×	×	
Nonionina umbilicatula (Montagu)	×		×	×	×	×	×
scapha (Fichtel and Moll)	×	×	×	×		×	×
advena Cushman, n. sp			×		×		
Cornuspira involvens (Reuss)	×	×	×				×

Distribution of Foraminifera of the Mint Spring marl and Byram marl—Continued.

	Mint Spring marl.						Byram marl.
	6452	6451	6447	6448	6647	7671	6455
Spiroloculina imprimata Cushman		×					×
antillarum D'Orbigny	×	×					
Vertebralina sp. ?		×					
Quinqueloculina bicostata D'Orbigny		×		×			×
cuvieriana D'Orbigny	×		×				×
vicksburgensis Cushman, n. sp			×				×
cookei Cushman, n. sp		×					
glabrata Cushman, n. sp	×	×	×				
lustra Cushman, n. sp				×			
tessellata Cushman, n. sp		×	×				
vulgaris D'Orbigny	×	×	×	×			
seminulum (Linnaeus)	×	×	×				
contorta D'Orbigny	×	×	×	×			
lamarckiana D'Orbigny			×				
Articulina byramensis Cushman	×	×					×
Massilina decorata Cushman, n. sp	×				×	×	
Triloculina peroblonga Cushman, n. sp		×					
sculpturata Cushman, n. sp		×	×				
Biloculina ornata D'Orbigny	×	×					

DESCRIPTIONS.

Family TEXTULARIIDAE.

Genus TEXTULARIA Defrance, 1824.

Textularia tumidulum Cushman.

Textularia tumidulum Cushman, U. S. Geol. Survey Prof. Paper 129, p. 89, pl. 15, figs. 1, 2a, 2b, 1922.

Test large, elongate, compressed, thickest in the central region, thence thinning toward the periphery, initial end rapidly broadening in the adult, the sides nearly parallel to a point near the apertural end, where the breadth of the test is often reduced; chambers numerous, in the adult about three times as wide as high, and often the last-formed chamber in old-age specimens somewhat distinctly set off from the others, the inner portion of each chamber much thicker than the other portions and in the rapid decrease in thickness often leaving a channel running lengthwise of the test between this central tumid area and the gradually sloping outer portion, usually well marked in adult specimens; sutures not very distinct; wall arenaceous, but smoothly finished. Length 2.5 millimeters or less.

This is the most common species of *Textularia* in the Mint Spring marl, occurring at the type station (6452, Mint Spring Bayou, Vicksburg, Miss.) and also at the following stations:

6447, 6448. Glass Bayou, Vicksburg, Miss.
6451. Mint Spring Bayou, Vicksburg, Miss.
7671. "Brown's Cave," Leaf River, Miss.

There is a considerable variation in relative length and breadth in the two forms of the species, the megalospheric form being usually broader and shorter, the microspheric form narrower but longer. The species was originally described from specimens obtained in the Byram marl at Byram, Miss.

Textularia mississippiensis Cushman.

Textularia mississippiensis Cushman, U. S. Geol. Survey Prof. Paper 129, p. 90, pl. 14, fig. 4, 1922.

Test elongate, fairly broad, thickest in the middle, thence thinning toward the periphery, in end view biconvex, central portion curved; chambers rather low and broad, especially in the early stages, becoming higher in the adult and often less broad so that the later chambers in the adult make a test less wide than at earlier stages; sutures covered by a coarsely arenaceous layer meeting in the center and at the periphery, leaving the central portion of each chamber uncovered; periphery irregular, not definitely or regularly spinose; chamber walls smooth and finely perforate. Length 0.40 to 0.75 millimeter.

This species, which was originally described from specimens obtained in the Byram marl at Byram, Miss, occurs at all six stations of the Mint Spring marl, as follows:

6447, 6448. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

The sutures are not always covered with a coarsely arenaceous layer but are typically so; this layer is often darker than the test and very distinct. Both megalospheric and microspheric forms occur. None of the specimens seem to have any definite regular spinose edge, and this is also true of the Byram specimens. The specimens in the Mint Spring marl seem to run slightly larger than those in the Byram marl; otherwise they are very similar.

Textularia subhauerii Cushman.

Textularia subhauerii Cushman, U. S. Geol. Survey Prof. Paper 129, p. 89, pl. 14, figs. 2a, 2b, 1922.

Test large, stout, elongate, early portion rapidly increasing in width with each newly added chamber, later adult portion with the sides nearly parallel, slightly lobulate; periphery rounded but the median portion nearly flat; chambers eighteen to twenty, increasing in height as added, those of the later portion nearly as high as broad, sutures usually rather indistinct; wall coarsely arenaceous but smoothly finished on the exterior; aperture at the base of the inner margin of the chamber. Length 2 millimeters or less.

The only station at which this species was obtained in the Mint Spring marl is station 6647 (Chickasawhay River 1¼ miles southwest of Boice, Miss.), at which there were numerous specimens. This is the only station of the six at which *Textularia tumidulum* did not occur. The specimens agree well with those from the Byram marl described in the paper cited.

Genus BOLIVINA D'Orbigny, 1839.

Bolivina cf. B. punctata D'Orbigny.

Test small, elongate, slightly tapering, composed of about twenty chambers; periphery slightly rounded; sutures distinct; wall finely punctate. Length about 0.25 millimeter.

A single specimen was obtained at station 6451, Mint Spring Bayou, Vicksburg, Miss. It is very small and in its general characters is like the recent material of the Gulf of Mexico which I have referred to *Bolivina punctata* D'Orbigny.

Bolivina cookei Cushman, n. sp.

Plate XXIX, figure 1.

Test elongate, tapering, the early portion with the periphery slightly rounded, thick, the later portion with the periphery subacute and the whole test broader and thinner: chambers numerous; sutures indistinct; surface of the earlier thickened portion ornamented by numerous fine longitudinal costae; later portion smooth but finely punctate. Length 0.25 to 0.35 millimeter.

Type specimen from station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss. Single specimens also occur at stations 6447 (Glass Bayou, Vicksburg, Miss.) and 7671 ("Brown's Cave," Leaf River, Miss.).

This is a small species but distinct in its general character. The last-formed portion differs from the early part in its broader form and smooth surface, the early part being much thicker and ornamented by fine longitudinal costae. Young specimens do not show the later characters.

The species is named for C. Wythe Cooke, of the United States Geological Survey, who has collected most of the material used in the present paper.

Bolivina vicksburgensis Cushman, n. sp.

Plate XXIX, figure 2.

Test elongate, tapering, apical end bluntly pointed, gradually increasing in breadth for several chambers, after which the sides are nearly parallel during the remainder of the growth: chambers distinct; sutures excavated; proximal angle of the periphery of each chamber somewhat projecting beyond the general line of the test, forming a serrate edge; chambers distinctly triangular; sutures oblique; surface with numerous punctations arranged generally in longitudinal lines. Length 0.45 millimeter.

Type specimen from station 6451, Mint Spring Bayou, Vicksburg, Miss. This species seems to be rare, not being found at any of the other stations. It is distinct from any others found in the Mint Spring marl or the Byram marl. It can be distinguished by the peculiar serrate periphery and the ornamentation.

Bolivina frondea Cushman, n. sp.

Plate XXIX, figure 3.

Test much compressed, broad, composed of several chambers, those of the early portion elongate, forming a narrow test, those of the adult extending back, forming a broad test similar to that seen in certain species of *Frondicularia*; sutures distinct; wall smooth; periph-

ery broadly rounded. Length slightly more than 1 millimeter.

Type specimen from station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss.

This is a very peculiar species which at first glance would be taken for the young of *Frondicularia*, but a further study shows that the chambers are alternating throughout, as in *Bolivina;* in some respects it remotely resembles *B. semialata* Bagg, which occurs off the Hawaiian Islands.

Genus VERNEUILINA D'Orbigny, 1840.

Verneuilina rectimargo Cushman, n. sp.

Plate XXIX, figures 4, 5.

Test elongate, triangular in cross section, early portion tapering, adult portion with the sides nearly parallel and straight; chambers numerous, arranged triserially; sutures not depressed, often slightly limbate; sides of the test flattened or very slightly concave; peripheral angles rounded; aperture slightly elongate at the base of the inner margin of the last-formed chamber; wall finely punctate. Length 1 millimeter or less.

Type specimen from station 6452, Mint Spring Bayou, Vicksburg, Miss. Specimens were also found in the Mint Spring marl at the following stations:

6447, 6448. Glass Bayou, Vicksburg, Miss.
6451. Mint Spring Bayou, Vicksburg, Miss.

This is a much longer species than *V. spinulosa glabrata*, which occurs in the Byram marl, and can be easily distinguished from it.

Genus GAUDRYINA D'Orbigny, 1839.

Gaudryina triangularis Cushman.

Gaudryina triangularis Cushman, U. S. Nat. Mus. Bull. 71, pt. 2, p. 65, figs. 104 a–c (in text), 1911; U. S. Nat. Mus. Bull. 103, p. 56, pl. 20, fig. 3, 1918; Carnegie Inst. Washington Pub. 291, p. 35, 1919.

Test slightly longer than broad, for the most part triangular, the angles rather acute, composed of a series of chambers triserially arranged, the later chambers rotund, biserially arranged, few in number; walls coarsely arenaceous, more or less smoothly finished; sutures plainly visible on the exterior; aperture narrow, between the inner border of the chamber and the preceding chamber; color gray. Length about 1 millimeter.

A single specimen from station 7671 ("Brown's Cave," Leaf River, Miss.) may belong to this species. It was originally described from specimens obtained off the Hawaiian Islands and is recorded as occurring near the Bonin Islands. I have also identified it in the Miocene marl from the gorge of Yumuri River, Matanzas, Cuba, and in the Oligocene from the lower part of the Culebra formation in the Canal Zone.

Gaudryina sp.?

Plate XXIX, figure 6.

There is a specimen from U. S. G. S. station 6451 (waterfall in Mint Spring Bayou, Vicksburg, Miss.; E. N. Lowe and C. W. Cooke, collectors) which is apparently a *Gaudryina*, but it is not well enough characterized for description.

Genus BULIMINA D'Orbigny, 1826.

Bulimina pupoides D'Orbigny.

Plate XXIX, figure 7.

Bulimina pupoides D'Orbigny, Foraminifères fossiles du bassin tertiaire de Vienne, p. 185, pl. 11, figs. 13, 14, 1846.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 400, pl. 50, figs. 15*a*, *b*, 1884.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 2, p. 80, figs. 132 a–c (in text), 1911.

Test ovate, broadest near the apertural end; apical end bluntly pointed, tapering; end view nearly circular; visible chambers numerous, much inflated; sutures rather deeply depressed; wall smooth; aperture long and narrow, with a narrow platelike tooth; color white. Length about 1 millimeter.

There are single specimens which may be referred to this species from the following stations:

6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

They are much longer than *B. ovata*, which occurs in the Byram marl.

Genus BULIMINELLA Cushman, 1911.

Buliminella subteres H. B. Brady var. angusta Cushman, n. var.

Plate XXIX, figures 8, 9.

Variety differing from the typical species in the more elongate, narrower shape of the test and the larger number of chambers; aperture elongate, nearly in the long axis of the test;

sutures not depressed, marked by darker lines of shell material. Length 0.6 millimeter.

Type specimen from station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss. It also occurred at these stations:

6447. Glass Bayou, Vicksburg, Miss.
6452. Mint Spring Bayou, Vicksburg, Miss.
7671. "Brown's Cave," Leaf River, Miss.

Specimens were very rare at all these stations. The typical form of the species occurs in the present oceans in the warmer parts of the Atlantic and in the Indo-Pacific. It has not been recorded as a fossil in the American Tertiary.

Buliminella contraria (Reuss) Cushman.

Rotalina contraria Reuss, Deutsch. geol. Gesell. Zeitschr., vol. 3, p. 76, pl. 5, fig. 37, 1851.
Buliminella contraria (Reuss) Cushman, U. S. Nat. Mus. Bull. 71, pt. 2, p. 89, figs. 143 a–c (in text), 1911.
Bulimina contraria (Reuss) H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 409, pl. 54, figs. 18 a-c, 1884.

Test coiled in a depressed spire, umbilicate, the chambers numerous, slightly inflated; sutures distinct, slightly depressed; wall smooth, calcareous; aperture distinctly bulimine, loop-like, rather long and narrow, extending to the umbilicus; color white. Length 0.65 millimeter.

There is a single specimen from station 6647 (Chickasawhay River 1¼ miles southwest of Boice, Miss.) which seems to be nearer to this than to any other species of the genus. The records for *B. contraria* are mostly from the south Pacific. Brady records one specimen from off the Azores, and I have recorded it from off the Hawaiian Islands. Bagg records very small specimens from the Pliocene sands of San Pedro, Calif. This is another of the species which seems to show the relation of the lower Oligocene of the Coastal Plain of the United States to the recent fauna of the Indo-Pacific.

Genus CASSIDULINA D'Orbigny, 1826.

Cassidulina crassa D'Orbigny.

Cassidulina crassa D'Orbigny, Voyage dans l'Amérique méridionale, Foraminifères, p. 56, pl. 7, figs. 18–20, 1839.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 429, pl. 54, figs. 4, 5, 1884.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 2, p. 97, figs. 151 a–c (in text), 1911.

Outline subcircular or oval, biconvex, with a broadly rounded peripheral border; chambers rather few, short, and inflated, the surface depressed at the sutures; wall calcareous, perforate, smooth; aperture a long, narrow slit just below and nearly parallel to the periphery of the test. Diameter 0.4 millimeter.

There are specimens from stations 6447 (Glass Bayou, Vicksburg, Miss.) and 6451 (Mint Spring Bayou, Vicksburg, Miss.) which seem rather to belong to this species than to *C. laevigata* D'Orbigny. The periphery has no keel and is lobulate, and the specimens are not so thick as most recent ones.

Family LAGENIDAE.

Genus LAGENA Walker and Boys, 1784.

Lagena laevigata (Reuss) Terrigi.

Fissurina laevigata Reuss, Akad. Wiss. Wien Denkschr., vol. 1, p. 366, pl. 46, fig. 1, 1849.
Lagena laevigata (Reuss) Terrigi, Accad. pont. Nuovi Lincei Atti, vol. 33, p. 177, pl. 1, fig. 6, 1880.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 473, pl. 114, figs. 8 a, b, 1884.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 7, pl. 2, fig. 1, 1913.

Test subglobose, compressed, somewhat pyriform in front view, elliptical in cross section; wall smooth, transparent in thin specimens or opaque in more thickened ones, along the lateral margins usually clear, even in thickened specimens; aperture elongate, fairly narrow, connecting with the interior by a fairly long entosolenian neck. Length 0.45 millimeter.

A single specimen from station 6451 (Mint Spring Bayou, Vicksburg, Miss.) can be referred to this species. It is small and has the characteristic shape.

Lagena striata (D'Orbigny) Reuss var. substriata Williamson.

Plate XXIX, figure 10.

Lagena substriata Williamson, Annals and Mag. Nat. Hist., 2d ser., vol. 1, p. 15, pl. 2, fig. 12, 1848.
Lagena vulgaris var. *substriata* Williamson, Recent Foraminifera of Great Britain, p. 7, pl. 1, fig. 14, 1858.
Lagena striata (D'Orbigny) Reuss var. *substriata* Williamson. Cushman, U. S. Nat. Mus. Bull. 71, pt. 2, p. 20, pl. 8, figs. 1–3, 1913.

Variety differing from the typical species in the more elongate body, long tapering neck, costulate surface extending up onto the neck, often to its end, and usually spirally arranged on the neck. Length 0.4 to 0.5 millimeter.

A single very typical specimen of this variety was found at station 7671, "Brown's Cave," Leaf River, Miss. The neck is somewhat broken, but the general form of the test and the ornamentation are those of the variety.

Lagena orbignyana (Seguenza) H. B. Brady var. flintii Cushman, n. var.

Plate XXIX, figure 11.

Lagena castrensis Flint (not Schwager), U. S. Nat. Mus. Ann. Rept. for 1897, p. 308, pl. 54, fig. 5, 1899.

Variety with a secondary keel at each side near the periphery and a series of two or three concentric lines of lacunae or pitted areas of uniform size inside the inner carina, the central part of the test being nearly smooth. Length 0.45 millimeter.

Type specimen from station 6447, Glass Bayou, Vicksburg, Miss. This is very similar to specimens from off the eastern coast of the United States figured by Flint, as cited above. The ornamentation is much more distinct on the peripheral portion than in the center, which is nearly smooth.

Lagena hexagona (Williamson) Siddall.

Plate XXIX, figure 12.

Entosolenia squamosa Montagu var. *hexagona* Williamson, Annals and Mag. Nat. Hist., 2d ser., vol. 1, p. 20, pl. 2, fig. 23, 1848; Recent Foraminifera of Great Britain, p. 13, pl. 1, fig. 31, 1858.

Lagena hexagona (Williamson) Siddall, Catalogue of British Recent Foraminifera, p. 6, 1879.

H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 472, pl. 58, figs. 32, 33, 1884.

Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 17, pl. 6, figs. 2, 3, 1913.

Test subglobular, broadly rounded at the apical end, bluntly pointed at the apertural end, surface ornamentation consisting of a reticulate pattern, the areoles of which are hexagonal, either arranged in vertical rows or irregular. Length 0.5 millimeter.

The only record for this species in this lot of material is from station 6452, Mint Spring Bayou, Vicksburg, Miss. It is similar to the specimen I have figured.[3]

Genus NODOSARIA Lamarck, 1812.

Nodosaria communis D'Orbigny.

Plate XXX, figure 4.

Nodosaria (*Dentalina*) *communis* D'Orbigny, Annales sci. nat., vol. 7, p. 254, No. 35, 1826.

Nodosaria communis H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 504, pl. 62, figs. 19–22, 1884.

Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 54, pl. 28, figs. 1, 2, 1913.

Test elongate, slender, tapering, straight or more often slightly curved, composed of numerous chambers, slightly inflated toward the apical end but later ones becoming more inflated; sutures oblique; aperture radiate, slightly eccentric, somewhat elongate; surface smooth. Length 3 millimeters or more.

Single specimens of this species were found at two stations:

6451. Mint Spring Bayou, Vicksburg, Miss.
7671. "Brown's Cave," Leaf River, Miss.

Nodosaria filiformis D'Orbigny.

Plate XXX, figures 1–3.

Nodosaria filiformis D'Orbigny, Annales sci. nat., vol. 7, p. 253, No. 14, 1826.

H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 500, pl. 63, figs. 3–5, 1884.

Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 55, pl. 27, figs. 1–4, 1913.

Test elongate, slender, arcuate; chambers numerous, elliptical or ovate, elongate, tumid, sutures usually oblique; chambers increasing in length toward the apertural end; aperture radiate, slightly eccentric; wall smooth. Length 5 millimeters or less.

Specimens showing a few chambers which seem to belong to this species were collected at three stations:

6448. Glass Bayou, Vicksburg, Miss.
6451. Mint Spring Bayou, Vicksburg, Miss.
7671. "Brown's Cave," Leaf River, Miss.

They are elongate, cylindrical, and slightly contracted at the ends, and the apertural end, where shown, is long and tapering.

Nodosaria obliqua (Linnaeus) H. B. Brady.

Plate XXX, figures 6, 7.

Nautilus obliquus Linnaeus, Systema naturae, 10th ed., p. 711, 1758; 13th ed. (Gmelin's), p. 3372, No. 14, 1788.

Nodosaria obliqua (Linnaeus), H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 513, pl. 64, figs. 20–22, 1884.

Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 59, pl. 25, fig. 5, 1913.

Nodosaria (*Dentalina*) *obliqua* (Linnaeus) Parker and Jones, Annals and Mag. Nat. Hist., 3d ser., vol. 3, p. 482, 1859.

Test elongate, tapering, apical end often with a spine; chambers numerous, in the early portion not distinct, in the later portion tumid; sutures depressed; surface ornamented with numerous rounded costae, fairly broad, as many as forty in the adult chambers of some of the specimens, costae continuous on the apical spine to the apertural end, additional ones added between those already formed;

[3] Cushman, J. A., op. cit., pl. 6, fig. 2.

aperture radiate. Length as much as 10 millimeters when complete.

Specimens were present in material from the following stations:

6452. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

This is quite possibly the same as the species from the Byram marl noted as a "single fragmentary specimen." [4]

Nodosaria sp.?

Plate XXX, figure 5.

There is a single specimen of *Nodosaria* from station 7671 ("Brown's Cave," Leaf River, Miss.) which may possibly be the young of *Nodosaria obliqua* but is here noted and figured that it may be on record for comparisons with forms from other horizons.

Genus CRISTELLARIA Lamarck, 1812.

Cristellaria convergens? Bornemann.

Cristellaria convergens Bornemann, Deutsch. geol. Gesell. Zeitschr., vol. 7, 1855, p. 327, pl. 13, figs. 16, 17.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 546, pl. 69, figs. 6, 7, 1884.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 68, pl. 34, fig. 3, 1913.

Test oval, biconvex, closely coiled; chambers triangular, the last-formed one drawn out to a point at the apertural end; sutures hardly visible, the chambers embracing to the umbo; wall smooth and thick. Length about 1 millimeter.

Single specimens that seem to be at least questionably this species were found at two stations:

6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

Cristellaria rotulata (Lamarck) D'Orbigny.

Plate XXXII, figure 1.

Lenticulites rotulata Lamarck, Annales du Muséum, vol. 5, p. 188, No. 3, 1804; vol. 8, pl. 62, fig. 11, 1806.
Cristellaria rotulata (Lamarck) D'Orbigny, Soc. géol. France Mém., 1st ser., vol. 4, p. 26, pl. 2, figs. 16–18, 1840.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 547; pl. 69, figs. 13*a*, *b*, 1884.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 66, pl. 35, fig. 3, 1913.

Test large, closely coiled; chambers numerous, lenticular, biconvex; wall smooth, thick; peripheral margin rather acute but not distinctly carinate; apertures of all chambers of visible test usually apparent. Length 1.5 to 2 millimeters.

Specimens that may be referred to this and the following species occurred in considerable numbers at station 7671, "Brown's Cave," Leaf River, Miss.

Cristellaria cultrata (Montfort) Parker and Jones.

Plate XXXI, figure 8.

Robulus cultratus Montfort?, Conchyliologie systématique, vol. 1, p. 214, 54e genre, 1808.
Cristellaria cultrata (Montfort) Parker and Jones, Philos. Trans., vol. 155, p. 344, pls. 13, 17, 18; pl. 16, fig. 5, 1865.
H. B. Brady, *Challenger* Rept., vol. 9, p. 550, pl. 70, figs. 4–6, 1884.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 64, pl. 29, fig. 5, 1913.
Robulina cultrata (Montfort) D'Orbigny, Annales sci. nat., vol. 7, p. 287, No. 1, Modèles, No. 82, 1826; Foraminifères fossiles du bassin tertiaire de Vienne, p. 96, pl. 4, figs. 14, 15, 1846.

Test very similar to that of *C. rotulata*, but with the added character of a peripheral keel of greater or less extent. Diameter 2 millimeters or less.

Specimens that may be considered *C. cultrata*, having a broader keel and somewhat different shape, with fewer chambers than *C. rotulata*, occurred with that species at station 7671, "Brown's Cave," Leaf River, Miss.

Cristellaria vicksburgensis Cushman, n. sp.

Plate XXXI, figures 6, 7.

Test composed of few chambers, seven to eight in the visible coil; surface generally smooth, except on the sutures, which are marked by rather broad, curved, raised ridges, those near the earlier part of the coil broken into rounded knobs, especially near the umbilical area, the later ones more continuous; periphery angled, the early portion carinate; apertural face smooth and somewhat concave with acute projecting angles; aperture radiate at the angle of the chamber. Length 0.65 to 1 millimeter.

Type specimen from station 6647, Chickasawhay River 1¼ miles southwest of Boice,

[4] Cushman, J. A., U. S. Geol. Survey Prof. Paper 129, p. 93, 1922 (Prof. Paper 129-E).

Miss. This species was also found at station 7671, "Brown's Cave," Leaf River, Miss.

This is undoubtedly the same as the species found in the Byram marl and recorded without a specific name.[5] It seems to be very constant in its characters and can be distinguished by the peculiar ornamentation, the uncoiling of the later portion of the test, and the concave apertural face.

Genus VAGINULINA D'Orbigny, 1826.

Vaginulina legumen (Linnaeus) D'Orbigny var. *elegans* (D'Orbigny) Fornasini.

Vaginulina legumen (Linnaeus) D'Orbigny var. elegans (D'Orbigny) Fornasini, Soc. geol. italiana Boll., vol. 5, p. 25, pl. 1, figs. 1?, 2–8, 1886.
Cushman, U. S. Geol. Survey Prof. Paper 129, p. 93, pl. 17, fig. 1, 1922.

There is a single broken specimen of this variety from station 6447 (Glass Bayou, Vicksburg, Miss.), similar in form to that which I have seen from the Philippines. This has also been recorded from the Byram marl.

Genus POLYMORPHINA D'Orbigny, 1826.

Polymorphina byramensis Cushman.

Polymorphina byramensis Cushman, U. S. Geol. Survey Prof. Paper 129, p. 94, pl. 17, figs. 2a, 2b, 1922.

Test short and broad, triangular, composed of a few chambers, usually only four, all except a final fifth chamber extending back to the base of the proloculum, forming a truncate test; chambers inflated; sutures deep and distinct; surface smooth; aperture radiate, only slightly produced. Length 0.75 millimeter or less.

This species, which is common in the Byram marl, has been found at all the stations in the Mint Spring marl studied in this collection, as follows:

6447, 6448. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

The specimens are very typical. A large proportion of them have three or four chambers with a triangular test, truncate at the base, the fifth chamber when present being added at a higher level.

[5] Cushman, J. A., U. S. Geol. Survey Prof. Paper 129, p. 93, 1922 (Prof. Paper 129–E).

Polymorphina regina H. B. Brady, Parker, and Jones.

Plate XXX, figure 8.

Polymorphina regina H. B. Brady, Parker, and Jones, Linnean Soc. London Trans., vol. 27, p. 241, pl. 41, figs. 32*a*, *b*, 1870.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 571, pl. 73, figs. 11–13, 1884.
Egger, K. bayer. Akad. Wiss. München Abh., Cl. 2, vol. 18, p. 310, pl. 9, figs. 45, 50, 51, 1893.
Millett, Roy. Micr. Soc. Jour., 1903, p. 265.
Bagg, Maryland Geol. Survey, Miocene, p. 478, pl. 133, fig. 7, 1904; U. S. Nat. Mus. Proc., vol. 34, p. 149, 1908.
Chapman, Quekett Micr. Club Jour., 2d ser., vol. 10, p. 132, pl. 10, fig. 4, 1907 [1909]; Roy. Soc. Victoria Proc., vol. 22, p. 281, 1910.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 91, pl. 41, figs. 6, 7, 1913.
Heron-Allen and Earland, Zool. Soc. London Trans., vol. 20, p. 673, 1915.
Cushman, U. S. Geol. Survey Bull. 676, p. 54, pl. 11, figs. 3, 4, 1918; U. S. Nat. Mus. Proc., vol. 56, p. 619, 1919; U. S. Geol. Survey Prof. Paper 129, pl. 18, fig. 4, 1922.

Test elongate, fusiform; chambers tumid, distinct, especially in the later portion; sutures deep; wall ornamented by numerous longitudinal costae, usually continuing unbroken across several chambers; aperture radiate, somewhat produced. Length 1 millimeter or less.

This species was found at three of the Mint Spring marl stations, as follows:

6448. Glass Bayou, Vicksburg, Miss.
6452. Mint Spring Bayou, Vicksburg, Miss.
7671. "Brown's Cave," Leaf River, Miss.

It also occurs in the Byram marl and has been recorded from the Miocene of the Coastal Plain of the United States, in the Calvert formation of Chesapeake Beach, Md. (Bagg), and the Duplin marl of Mayesville, S. C. (Cushman). It is a fairly common species in recent seas in the Indo-Pacific region.

Polymorphina problema D'Orbigny.

Polymorphina (Guttulina) problema D'Orbigny, Annales sci. nat., vol. 7, p. 266, No. 14, Modèles, No. 61, 1826.
Cushman, U. S. Geol. Survey Prof. Paper 129, p, 94. pl. 18, fig. 1, 1922.
Guttulina problema D'Orbigny, Foraminifères fossiles du bassin tertiaire de Vienne, p. 224, pl. 12, figs. 26–28, 1846.

Test elongate, fusiform, composed of few chambers, tumid; sutures slightly depressed;

apical end bluntly pointed, apertural end tapering; surface smooth; aperture radiate. Length 1 millimeter or less.

A few specimens have been collected in the Mint Spring marl at the following stations:

6452. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

Polymorphina gibba D'Orbigny.

Polymorphina (Globulina) gibba D'Orbigny, Annales sci. nat., vol. 7, p. 226, No. 20, Modèles, No. 63, 1826.
Polymorphina gibba H. B. Brady, Parker, and Jones (part), Linnean Soc. London Trans., vol. 27, p. 216, pl. 39, figs. 2a–d, 1870.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 561, pl. 71, figs. 12a, b, 1884.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 85, pl. 41, fig. 4, 1913; U. S. Geol. Survey Bull. 676, p. 11, pl. 2, fig. 4; p. 52, pl. 11, fig. 5, 1918; U. S. Geol. Survey Prof. Paper 129, p. 93, pl. 17, fig. 3, 1922.

Test rotund, in front view nearly circular, in end view broadly oval; chambers few, distinct; sutures distinct, but little if at all excavated; wall smooth and translucent; aperture slightly produced, radiate. Length 0.75 millimeter or less.

Very rotund specimens which are here referred to this species were found in the Mint Spring marl at the following stations:

6447. Glass Bayou, Vicksburg, Miss.
6451. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

This species also occurs in the Byram marl, and I have recorded it from the Pliocene Caloosahatchee marl on Shell Creek, Fla., and from the Miocene Calvert formation at Chesapeake Beach, Md. (Bagg), and Duplin marl at Mayesville, S. C.

Polymorphina amygdaloides (Reuss) Reuss?

Globulina amygdaloides Reuss, Deutsch. geol. Gesell. Zeitschr., vol. 3, p. 82, pl. 6, fig. 47, 1851.
Polymorphina amygdaloides (Reuss) Reuss, Akad. Wiss. Wien Sitzungsber., vol. 18, p. 250, pl. 8, fig. 84, 1855.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 560, pl. 71, fig. 13(?), 1884.
Bagg, U. S. Nat. Mus. Proc., vol. 34, p. 148, 1908.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 85, pl. 41, fig. 5, 1913; U. S. Geol. Survey Prof. Paper 129, p. 95, pl. 18, figs. 2a, 2b, 1922.

Test elongate-oval, much compressed, composed of few chambers, which are elongate and narrow; sutures rather indistinct, not depressed; surface smooth; aperture somewhat produced. Length 0.65 millimeter or less.

Elongate specimens somewhat like those figured in the paper on the Byram marl were found in the Mint Spring marl at the following stations:

6447, 6448. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.
7671. "Brown's Cave," Leaf River, Miss.

The specimens are very doubtfully identical with the species of Reuss.

Polymorphina equalis D'Orbigny.

Plate XXXI, figure 3.

Polymorphina equalis D'Orbigny, Annales sci. nat., vol. 7, p. 265, No. 13, 1826.
Polymorphina aequalis D'Orbigny, Foraminifères fossiles du bassin tertiaire de Vienne, p. 227, pl. 13, figs. 11, 12. 1846.
Polymorphina gibba var. *aequalis* H. B. Brady, Parker, and Jones, Linnean Soc. London Trans., vol. 27, p. 216, pl. 39, figs. 2c, d, 1870.

Test compressed, broadly oval; periphery rather evenly curved, rounded, composed of few chambers; sutures distinct but very slightly depressed; wall smooth; aperture radiate. Length 0.7 to 0.8 millimeter.

This species described by D'Orbigny occurs sparsely in the Mint Spring marl at two stations:

6448. Glass Bayou, Vicksburg, Miss.
6451. Mint Spring Bayou, Vicksburg, Miss.

Polymorphina advena Cushman, n. sp.

Plate XXXI, figure 4.

Test much compressed, broadly ovate; chambers numerous, elongate, alternating, much the broadest near the peripheral end; sutures slightly depressed; surface ornamented with numerous fine longitudinal costae, except the last-formed one of two chambers, which are smooth, at least at the apertural end; aperture radiate. Length 1 millimeter.

Type specimen from station 6451, Mint Spring Bayou, Vicksburg, Miss.

This species is an unusual one for this genus, appearing much more like a *Bolivina*, but it has the characteristic aperture of *Polymorphina*. It is perhaps closest related to *Polymorphina complanata* D'Orbigny.

Polymorphina cuspidata H. B. Brady.

Plate XXX, figures 9, 10.

Polymorphina sororia Reuss var. *cuspidata* H. B. Brady, *Challenger* Rept., p. 563, pl. 71, figs. 17–19; pl. 72, fig. 4, 1884.

Test elongate, fusiform, composed of a few chambers, initial end with a prominent sharp, elongate spine, apertural end bluntly pointed; surface smooth; sutures somewhat depressed; aperture radiate. Length 1.5 millimeters or less.

There are several specimens from station 6447 (Glass Bayou, Vicksburg, Miss.) which are very close to this form as figured by Brady in the *Challenger* report. The relation of this form to *P. sororia* Reuss seems very problematic, and I have given it specific rank. It is also represented in the Mint Spring marl by the variety described below.

Polymorphina cuspidata H. B. Brady var. costulata Cushman, n. var.

Plate XXXI, figure 1.

Variety differing from the typical species in the surface ornamentation, which consists of a few longitudinal costae, rather widely separated from each other.

Type specimen from station 6452, Mint Spring Bayou, Vicksburg, Miss.

Polymorphina vicksburgensis Cushman, n. sp.

Plate XXXI, figure 2.

Test elongate, fusiform, broadest near the initial end, which is subcircular in transverse section, the later portion becoming compressed and narrower, initial end bluntly pointed, or with a short spine; chambers becoming shorter toward the apertural ends in the adult; surface smooth, or with very slight longitudinal costae; sutures not depressed but often standing out as clearer areas in side view; aperture radiate. Length 1.5 millimeters or less.

Type specimen from station 6451, Mint Spring Bayou, Vicksburg, Miss. This species occurs also at station 6448, Glass Bayou, Vicksburg, Miss.

This seems to be different from the other described species of this genus and may be distinguished especially by the cuspidate initial end and the peculiar change in shape from the rounded early portion to the narrow, compressed last-formed portion.

Polymorphina spinosa (D'Orbigny) Egger.

Plate XXXI, figure 5.

Globulina spinosa D'Orbigny, Foraminifères fossiles du bassin tertiaire de Vienne, p. 230, pl. 13, figs. 23, 24, 1846.

Polymorphina spinosa (D'Orbigny) Egger, Neues Jahrb., 1857, p. 292, pl. 14, figs. 9, 10,

H. B. Brady, Parker, and Jones, Linnean Soc. London Trans., vol. 27, p. 243, pl. 42, figs. 36a, b, 1870.

Test rounded, irregular; chambers few; surface covered with numerous short, projecting spines which seem to be hollow where broken. Length 1 millimeter or less.

Rare specimens were obtained at the following stations:

6447. Glass Bayou, Vicksburg, Miss.
6451. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

This species was originally described by D'Orbigny from specimens collected in the Vienna Basin, and the specimens from the Mint Spring marl, except that they are more irregular in form, agree at least in the ornamentation of the surface.

Genus UVIGERINA D'Orbigny, 1826.

Uvigerina byramensis Cushman.

Uvigerina byramensis Cushman, U. S. Geol. Survey Prof. Paper 129, p. 95, pl. 18, fig. 5, 1922.

Test minute, elongate, somewhat fusiform, initial end pointed; chambers numerous, distinct; sutures depressed; surface ornamented by longitudinal costae, rather thin and sharp; the last-formed chamber more distinct than the rest, the inner side concave, the other two sides slightly convex, giving a generally triangular section, the surface of the last-formed chamber smooth; the apertural end produced into a short cylindrical neck with a slight lip, the aperture circular. Length 0.25 to 0.40 millimeter.

This species, originally described from specimens collected in the Byram marl, has been found at all but one of the stations in the Mint Spring marl, as follows:

6447. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

The characters that distinguish this species seem to be very constant, and the last-formed

chambers, especially where they are not close-set, have the distinct triangular shape which characterizes the type specimens.

Uvigerina pigmea D'Orbigny.

Plate XXXII, figure 2.

Uvigerina pigmea D'Orbigny, Annales sci. nat., vol. 7, p. 269, pl. 12, figs. 8, 9, Modèles, No. 67, 1826.
Uvigerina pygmaea D'Orbigny, Foraminifères fossiles du bassin tertiaire de Vienna, p. 190, pl. 11, figs. 25, 26, 1846.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 575, pl. 74, figs. 11–14, 1884.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 96, pl. 42, fig. 1; pl. 44, fig. 5, 1913; U. S. Nat. Mus. Bull. 103, p. 63, pl. 22, fig. 4, 1918; U. S. Geol. Survey Bull. 676, p. 55, 1918.

Test subcylindrical, triserially spiral; chambers numerous, inflated; sutures deep; wall ornamented by numerous longitudinal costae, those of each chamber usually independent of those of adjacent chambers; aperture with a short cylindrical neck and phialine lip. Length 0.75 to 1 millimeter.

Specimens that may be referred to this species were found at the following stations:

6447. Glass Bayou, Vicksburg, Miss.
6452. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

It has occurred in the Miocene of Maryland (Bagg), and in the St. Marys (?) formation in a well at Norfolk, Va. (depth 645 feet). I have also recorded it from the Culebra formation of the Canal Zone, and it may occur in the Miocene of the Gatun formation of the Canal Zone.

Family GLOBIGERINIDAE.

Genus GLOBIGERINA D'Orbigny, 1826.

Globigerina bulloides D'Orbigny.

Globigerina bulloides D'Orbigny, Annales sci. nat., vol. 7, p. 277, No. 1, Modèles, Nos. 17 and 76, 1826.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 593, pl. 77; pl. 79, figs. 3–7, 1884.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 4, p. 5, pl. 2, figs. 7–9; pl. 9, 1914; U. S. Nat. Mus. Bull. 103, p. 64, 1918; U. S. Geol. Survey Bull. 676, p. 12, pl. 3, fig. 2; p. 56, pl. 3, figs. 4, 6, 1918; Carnegie Inst. Washington Pub. 291, p. 38, 1919; U. S. Geol. Survey Prof. Paper 129, p. 95, pl. 19, figs. 1–3, 1922.

Test subglobose, spiral, made up of a few inflated chambers, all visible from the dorsal side, three to four visible from the ventral side; sutures deep, surface reticulate.

This common species, which has been recorded in the Pliocene, Miocene, and Oligocene, occurs in the Mint Spring marl at four stations, as follows:

6447. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.
7671. "Brown's Cave," Leaf River, Miss.

Globigerina dutertrei D'Orbigny.

Globigerina dutertrei D'Orbigny, in De la Sagra, Histoire physique, politique et naturelle de l'île de Cuba, Foraminifères, p. 95, pl. 4, figs. 19–21, 1839.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 601, pl. 81, figs. 1a–c, 1884.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 4, p. 8, 1914.

Test rounded, the dorsal side slightly convex, the ventral side more strongly convex, composed of about three whorls, the last one consisting of four to five chambers, much inflated, especially the later ones, umbilicate; aperture comparatively small, a single arched opening near the umbilical edge of the last-formed chamber. Diameter 0.60 millimeter or less.

Specimens apparently belonging to this species, which D'Orbigny described from material collected in the West Indies, occurred at three stations, as follows:

6451. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

Family ROTALIIDAE.

Genus SPIRILLINA Ehrenberg, 1841.

Spirillina limbata H. B. Brady var. bipunctata Cushman, n. var.

Plate XXXII, figures 3–5.

Test very similar in general to that of *Spirillina limbata* but differing in the character of the ornamentation, the area of the dorsal surface being ornamented in the adult of this variety by a double series of deep punctations inside the raised carina.

Type specimen from station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss. This variety is also present in the Mint Spring marl at the following stations:

6447. Glass Bayou, Vicksburg, Miss.
6451, 6482. Mint Spring Bayou, Vicksburg, Miss.
7671. "Brown's Cave," Leaf River, Miss.

In recent seas *S. limbata* is known from the Pacific, being one of the forms that are characteristic of the Indo-Pacific region, and it is also

characteristic of the lower Oligocene of the Coastal Plain of the United States.

The young of this species has only a single row of pits, becoming double in the adult. The ornamentation of the ventral side is shown in figure 5.

Genus PATELLINA Williamson, 1858.

Patellina advena Cushman, n. sp.

Plate XXXI, figure 9.

Test plano-convex, early portion composed of chambers spirally arranged, later ones elongate and becoming nearly annular; chambers partly divided by numerous longitudinal internal septa, visible from the exterior, forming what seems to be a radiating pattern; ventral side with numerous radiating lines. Diameter 0.4 millimeter.

Type specimen from station 6452, Mint Spring Bayou, Vicksburg, Miss.

This species differs from *Patellina corrugata* Williamson in the much finer division by internal septa. The spire is low, making a broad, flaring test.

Genus DISCORBIS Lamarck, 1804.

Discorbis auracana (D'Orbigny) Cushman.

Plate XXXII, figure 6.

Rosalina auracana D'Orbigny, Voyage dans l'Amérique méridionale, Foraminifères, p. 44, pl. 6, figs. 16–18, 1839.

Discorbis auracana (D'Orbigny) Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 15, pl. 9, fig. 3; fig. 15 (in text).

Discorbina auracana (D'Orbigny) Parker and Jones, Geol. Soc. London Quart. Jour., vol. 28, p. 115, 1872.

H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 645, pl. 86, figs. 10, 11, 1884.

Test small, plano-convex, dorsal side slightly convex, ventral side flat or slightly concave, peripheral margin rather acutely rounded; chambers six to nine in the last-formed whorl; sutures slightly depressed, often limbate with clear shell material; early chambers often carinate with similar material; wall finely punctate; aperture a narrow curved slit at the margin of the ventral side of the chamber; color brownish, especially in the earlier chambers. Diameter 0.3 to 0.5 millimeter.

Specimens that are referred to this species were rare at a single station, 6447, Glass Bayou, Vicksburg, Miss. The sutures are limbate, and the last-formed chamber has a projecting lip above the aperture.

Discorbis bertheloti (D'Orbigny) Cushman.

Plate XXXII, figure 7.

Rosalina bertheloti D'Orbigny, in Barker, Webb, and Berthelot, Histoire naturelle des îles Canaries, vol. 2, pt. 2, Foraminifères, p. 135, pl. 1, figs. 28–30, 1839.

Discorbis bertheloti (D'Orbigny) Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 20, pl. 7, fig. 3, 1913; U. S. Geol. Survey Bull. 676, p. 58, pl. 15, figs. 1–3, 1918.

Discorbina bertheloti (D'Orbigny) H. B. Brady, Linnean Soc. London Trans., vol. 24, p. 469, pl. 48, figs. 10a, b, 1864; *Challenger* Rept., Zoology, vol. 9, p. 650, pl. 89, figs. 10–12, 1884.

Test unequally biconvex, usually six to seven chambers in the last-formed coil, dorsal side usually flattened, ventral side more convex; sutures curved, fairly distinct on both sides, occasionally slightly limbate; aperture usually extending into the dorsal side so that a portion of the aperture is peripheral. Diameter 0.80 millimeter or less.

This species occurs at two Mint Spring marl stations:

6451, 6452. Mint Spring Bayou, Vicksburg, Miss.

I have also recorded it from the Miocene of the Coastal Plain in the Choctawhatchee marl 1 mile south of Red Bay, Fla.; in the Duplin marl (?) of South Carolina (locality unknown); and in the Yorktown formation at Suffolk, Va.

Genus TRUNCATULINA D'Orbigny, 1826.

Truncatulina lobatula (Walker and Jacob) D'Orbigny.

Nautilus lobatulus Walker and Jacob, Adams's Essays on the microscope, Kanmacher's ed., p. 642, pl. 14, fig. 36, 1798.

Truncatulina lobatula (Walker and Jacob) D'Orbigny, in Barker, Webb, and Berthelot, Histoire naturelle des îles Canaries, vol. 2, pt. 2, Foraminifères, p. 134, pl. 2, figs. 22–24, 1839; Foraminifères fossiles du bassin tertiaire de Vienne, p. 168, pl. 9, figs. 18–23, 1846.

H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 660, pl. 92, fig. 10; pl. 93, fig. 1, 1884.

Cushman, U. S. Geol. Survey Bull. 676, p. 16, pl. 1, fig. 10; p. 60, pl. 17, figs. 1–3; U. S. Geol. Survey Prof. Paper 129, p. 26, pl. 20, figs 1–3, 1922.

Test plano-convex, flattened on the ventral face, moderately convex dorsally, peripheral margin rounded; chambers numerous, seven or eight in the last-formed whorl; sutures depressed, especially on the dorsal face; wall smooth, punctate.

Specimens were obtained at five of the six Mint Spring marl stations, as follows:

6448. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

This species is common both in the Tertiary and in the present oceans. I have recorded it from the Pliocene and the Miocene of the Coastal Plain of the United States and the Oligocene (Byram marl) at Byram, Miss.

Truncatulina byramensis Cushman.

Truncatulina byramensis Cushman, U. S. Geol. Survey Prof. Paper 129, p. 96, pl. 20, figs. 4–6, 1922.

Test plano-convex, dorsal side slightly convex, ventral side flattened, peripheral margin subcarinate; about eight chambers in the last-formed whorl, chambers on the ventral side failing to reach the center of the test, leaving a definite umbilical area, which is filled with clear shell material; on the dorsal side each chamber at its inner border has the angles somewhat produced and a broad, rounded reentrant near the middle; on the ventral side the inner half of the chamber is rather intricately lobed, the chambers themselves of lighter color; the sutures darker, of clear shell material; surface finely granular; aperture an elongate opening at the base of the last-formed chamber near its inner ventral border. Diameter 0.35 to 0.75 millimeter.

Specimens of this species were collected at the following stations:

6451, 6452. Mint Spring Bayou, Vicksburg, Miss.
6447, 6448. Glass Bayou, Vicksburg, Miss.

This species was described from specimens obtained in the Byram marl, where it is common. It is a peculiar species, easily distinguished by the unusual lobed chambers.

Truncatulina americana Cushman var.

Truncatulina americana Cushman, U. S. Geol. Survey Bull. 676, p. 63, pl. 20, figs. 2, 3; pl. 21, fig. 1, 1918; U. S. Nat. Mus. Bull. 103, p. 68, pl. 23, figs. 2 a–c, 1918; U. S. Geol. Survey Prof. Paper 129, p. 97, pl. 20, figs. 7, 8, 1922.

Test plano-convex, dorsal side nearly flat, ventral side slightly convex; chambers numerous, ten to fifteen in the last-formed coil, rather rapidly increasing in size, peripheral margin subangular, dorsal side with the last few chambers failing to meet the umbilicus, ventral side similar in this respect in most specimens; sutures distinct, slightly limbate on the dorsal side, depressed on the ventral side; wall smooth, punctate, aperture peripheral with a slight lip. Diameter 0.75 millimeter or less.

Small specimens of this species with a slightly broader form than the typical occur in the Mint Spring marl at the following stations:

6447, 6448. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.

This species is found in the Miocene and Oligocene of the Coastal Plain and in the upper Oligocene of the Canal Zone.

Truncatulina pseudoungeriana Cushman.

Truncatulina ungeriana H. B. Brady (not *Rotalina ungeriana* D'Orbigny, 1826), *Challenger* Rept., Zoology, vol. 9, pl. 94, figs. 9 a–c, 1884.
Cushman, U. S. Nat. Mus. Bull. 103, p. 69, pl. 24, fig. 1, 1918.
Truncatulina pseudoungeriana Cushman, U. S. Geol. Survey Prof. Paper 129, p. 97, pl. 20, fig. 9, 1922.

Test biconvex, almost equally so, periphery subacute; chambers nine to eleven in the last-formed whorl, those of the earlier whorls not showing on either the ventral or the dorsal side, on the dorsal because they are hidden by the roughness of the surface, and on the ventral because of the involute character; periphery lobulate; sutures distinct above in the last whorl and very distinct below, as the sutures are somewhat tumid on the ventral side; umbilical region filled nearly flush with the chambers by clear shell material, last few chambers on the dorsal side slightly above the surface on the inner margin; surface dorsally with coarse punctae, below smooth and more finely punctate; aperture at the periphery. Diameter 1 millimeter or less.

Specimens of this species were common in the Mint Spring marl at station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss. It occurred more rarely at the following stations:

6447. Glass Bayou, Vicksburg, Miss.
6451. Mint Spring Bayou, Vicksburg, Miss.
7671. "Brown's Cave," Leaf River, Miss.

Truncatulina vicksburgensis Cushman, n. sp.

Plate XXXV, figures 7, 8.

Test plano-convex, dorsal side with the sutures very obscure, low-spired, periphery subacute, ventral side with a central raised area and the inner angle of each chamber ending in a raised knob, ventral side of the cham-

bers somewhat irregularly granular, especially toward the inner margin; otherwise the chambers are not distinct from one another. Diameter 0.50 to 0.60 millimeter.

Type specimen from station 6448, Glass Bayou, Vicksburg, Miss.

This differs from the other species of the genus found in the lower Oligocene of the Coastal Plain in its form, its indistinct chambers, and the peculiar ornamentation of the ventral side.

Genus ANOMALINA D'Orbigny, 1826.

Anomalina bilateralis Cushman.

Anomalina bilateralis Cushman, U. S. Geol. Survey Prof. Paper 129, p. 97, pl. 21, figs. 1, 2, 1922.

Test of about four coils, bilateral or nearly so, composed of numerous chambers, ten or more in the last-formed whorl, umbilical region on both sides with a knob of clear shell material, more pronounced on the dorsal side; chambers smooth but coarsely punctate, more coarsely so on the ventral side; sutures broad and somewhat limbate with clear shell material; aperture a narrow curved opening at the base of the final chamber. Diameter 1 millimeter or less.

This is one of the species described from specimens collected in the Byram marl, where it was rare, at least at the type station. In the Mint Spring marl it occurred sparsely at the following stations:

6448. Glass Bayou, Vicksburg, Miss.
6451. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

Anomalina mississippiensis Cushman.

Anomalina mississippiensis Cushman, U. S. Geol. Survey Prof. Paper 129, p. 98, pl. 21, figs. 6–8, 1922.

Test small, plano-convex, of about two and one-half coils, periphery slightly lobulate, bluntly rounded, dorsal side very much flattened, even slightly concave, ventral side very convex; chambers comparatively few, six to eight in the last-formed coil; sutures curved, on the dorsal side broad and limbate, even with the surface of clear shell material, on the ventral side narrower and depressed; the last-formed two or three chambers on the inner margin on the dorsal side slightly above the general surface; wall thin and translucent, especially on the dorsal side, smooth; on the ventral finely punctate and not so clear; aperture a curved opening at the inner margin at the periphery. Length 0.25 to 0.35 millimeter; breadth 0.20 to 0.30 millimeter.

This small species is fairly common in the Byram marl and is common in the Mint Spring marl at all the stations, as follows:

6447, 6448. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

Anomalina vicksburgensis Cushman, n. sp.

Plate XXXV, figures 5, 6.

Test unequally biconvex, dorsal side more flattened than the ventral; chambers numerous, ten to twelve in the last-formed coil; sutures slightly limbate; periphery rounded, not lobulate; wall between the sutures finely granular or punctate, ventral side with a clear mass of shell material at the umbilicus. Diameter 0.35 millimeter.

Type specimen from station 6452, Mint Spring Bayou, Vicksburg, Miss. This is a peculiar species of the genus; it is rare at the type station and was not found in any other Mint Spring material.

Genus SIPHONINA Reuss, 1849.

Siphonina advena Cushman.

Siphonina advena Cushman, U. S. Geol. Survey Prof. Paper 129, p. 98, pl. 22, figs. 1–2, 1922.

Test unequally biconvex, dorsal side usually less convex than the ventral; periphery subacute; chambers in three or more coils, four chambers making up the last-formed coil; sutures distinct, on the dorsal side flush with the surface, on the ventral side slightly depressed, on the dorsal side somewhat broadened and limbate, ventrally narrow; surface smooth but punctate; aperture with a short neck, compressed, with a phialine lip and elliptical aperture; color, even in the fossil specimens, somewhat brownish; wall thin and translucent. Diameter 0.50 millimeter or less.

Specimens of this species occurred at all six of the Mint Spring marl stations, as follows:

6447, 6448. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

It was common in the marl at Byram, Miss.

Genus GYPSINA Carter, 1877.

Gypsina rubra (D'Orbigny) Heron-Allen and Earland.

Planorbulina rubra D'Orbigny, Annales sci. nat., vol. 7, p. 280, No. 4, 1826.
Fornasini, Accad. sci. Ist. Bologna Mem., 6th ser., vol. 5, p. 44, pl. 2, fig. 3, 1908.
Gypsina rubra (D'Orbigny) Heron-Allen and Earland, Zool. Soc. London Trans., vol. 20, p. 725, pl. 53, figs. 35–37, 1915.
Cushman, U. S. Geol. Survey Prof. Paper 129, p. 98, pl. 22, fig. 3, 1922.

This species, recorded from the Byram marl, has also been found at three of the stations in the Mint Spring marl, as follows:

6452. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

This is a species from the Indo-Pacific which occurs in the lower Oligocene of the Coastal Plain of the United States.

Genus PULVINULINA Parker and Jones, 1862.

Pulvinulina byramensis Cushman.

Pulvinulina byramensis Cushman, U. S. Geol. Survey Prof. Paper 129, p. 99, pl. 22, figs. 4, 5, 1922.

Test small, biconvex, rotaliform, consisting of about three coils, seven to eight chambers in the last-formed coil; on the dorsal side sutures oblique and at a considerable angle with the periphery, somewhat limbate; on the ventral side the chambers extend in to the center, which is usually not umbilicate; sutures nearly straight; surface polished, punctations appearing as light tubules against the translucent wall; aperture near the inner end of the chamber on the ventral side with a definite valvular lip, the aperture hidden below but when examined found to be composed, in the adult, of several adjacent small rounded openings. Diameter 1.5 millimeters or less.

This species, which was described from abundant specimens obtained in the Byram marl at Byram, Miss., has occurred at all six of the stations in the Mint Spring marl, as follows:

6447, 6448. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice; Miss.
7671. "Brown's Cave," Leaf River, Miss.

At many of these stations it is common and corresponds closely to the description given above.

Pulvinulina glabrata Cushman.

Pulvinulina glabrata Cushman, U. S. Geol. Survey Prof. Paper 129, p. 99, pl. 22 figs. 6, 7, 1922.

Test biconvex, elongate, somewhat lobulate, composed of about two coils, seven chambers in the last-formed one, dorsal side convex; sutures depressed, curved; chambers convex between, rapidly increasing in size as added; dorsal side very coarsely punctate, the sutures somewhat limbate, ventral side umbilicate; surface smooth and with very fine punctations; sutures distinct; last-formed chamber with a long, straight valvular lip across the whole of the depressed umbilicus; aperture beneath the lip. Length 0.5 millimeter.

This species, which was rare in the marl at Byram, Miss., has been found at four of the stations in the Mint Spring marl, as follows:

6448. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.
7671. "Brown's Cave," Leaf River, Miss.

It is in some ways related to the species described and figured by Brady in the *Challenger* report as *Discorbina ventricosa* H. B. Brady. It is more elongate than that form, and the last-formed chamber especially gives it an entirely different shape. It is one of the most striking species in this lower Oligocene material.

Genus ROTALIA Lamarck, 1804.

Rotalia byramensis Cushman.

Rotalia byramensis Cushman, U. S. Geol. Survey Prof. Paper 129, p. 99, pl. 23, fig. 1, 1922.

Test unequally biconvex, rotaliform, in the last-formed coil six to seven chambers, dorsally with the chambers somewhat triangular; sutures oblique, limbate, broad, of clear shell material; ventral side with a large circular mass in the umbilical region, with the sutures deep and ending in a depressed ring about it; aperture with a somewhat valvular lip, often divided into several teeth; surface on the dorsal side somewhat roughened, on the ventral side scrobiculate near the periphery, smoother near the center. Diameter 2 millimeters or less.

Specimens that may be referred to this species were found at stations 6447 and 6448, Glass Bayou, Vicksburg, Miss.

The species is perhaps closest to *Rotalia armata* D'Orbigny. The chambers are triangular, and where there is a spinose projection it is at the angle rather than at the middle portion of the chamber, as in *R. armata*.

Rotalia dentata Parker and Jones var. parva Cushman, n. var.

Plate XXXV, figures 1, 2.

Variety differing from the typical species in the size and the number of chambers, having usually but five chambers in the last-formed coil, each with a single spine from the periphery at the center of each chamber. Diameter 0.65 millimeter.

Type specimen from station 6451, Mint Spring Bayou, Vicksburg, Miss. This also occurs at the following stations:

6447, 6448. Glass Bayou, Vicksburg, Miss.
6452. Mint Spring Bayou, Vicksburg, Miss.

Rotalia vicksburgensis Cushman, n. sp.

Plate XXXV, figures 3, 4.

Test spiral, dorsal side flattened, ventral side strongly convex, umbilicate, about eight chambers in the last-formed coil; chambers distinct, inflated; sutures distinct, slightly depressed; surface smooth, finely punctate. Diameter 0.75 millimeter or less.

Type specimens from station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss. It also occurred at the following stations:

6448. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.
7671. "Brown's Cave," Leaf River, Miss.

This species is apparently related to *R. soldanii* D'Orbigny, but it does not have nearly so great a height, the line between adjacent whorls is not channeled, and in general it has a much more primitive form.

Family NUMMULITIDAE.

Genus NONIONINA D'Orbigny, 1826.

Nonionina umbilicatula (Montagu) Parker, Jones, and H. B. Brady.

Nautilus umbilicatulus Montagu, Testacea Britannica, p. 191, 1803; Suppl., p. 78, pl. 18, fig. 1, 1808.
Nonionina umbilicatula (Montagu) Parker, Jones, and H. B. Brady, Annals and Mag. Nat. Hist., 4th ser., vol. 8, p. 242, pl. 12, fig. 157, 1871.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 726, pl. 109, figs. 8, 9, 1884.
Cushman, U. S. Geol. Survey Prof. Paper 129, p. 100, pl. 23, figs. 3, 4, 1922.

Test biconvex, peripheral margin rounded; chambers ten or more in the last-formed coil; sutures limbate but not depressed, deep, umbilicate; wall smooth, punctate toward the periphery; aperture a very narrow curved opening at the base of the chamber, peripheral. Diameter 0.5 to 0.6 millimeter.

Specimens that may be referred to this species occurred at all but one of the Mint Spring marl stations, as follows:

6447, 6448. Glass Bayou, Vicksburg, Miss.
6452. Mint Spring Bayou, Vicksburg, Miss.
6647. Chickasawhay River 1¼ miles southwest of Boice, Miss.
7671. "Brown's Cave," Leaf River, Miss.

Specimens were not common, however, at any of these stations. I have already recorded the species from the Miocene near Centerville, Md.

Nonionina scapha (Fichtel and Moll) Parker and Jones.

Nautilus scapha Fichtel and Moll, Testacea microscopica, p. 105, pl. 19, figs. d-f, 1803.
Nonionina scapha (Fichtel and Moll), Parker and Jones, Annals and Mag. Nat. Hist., 3d ser., vol. 5, p. 102, No. 4, 1860.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 730, pl. 109, figs. 14, 15, 16?, 1884.
Cushman, U. S. Nat. Mus. Bull. 103, p. 73, pl. 25, figs. 6a, b, 1918; U. S. Geol. Survey Prof. Paper 129, p. 100, pl. 23, figs. 5-7, 1922.

Test in side view longer than wide, about ten chambers in the last-formed coil, rapidly increasing in length as added; sutures evenly curved, slightly depressed; periphery broadly rounded, in apertural view the face of the last-formed chamber making up a large part of the visible surface; wall smooth, finely punctate, somewhat umbilicate; aperture an arched slit at the base of the chamber. Length 0.60 millimeter.

Specimens of this species were more common than those of *N. umbilicatula*. They occurred at all but one of the stations in the Mint Spring marl, as follows:

6447, 6448. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.
7671. "Brown's Cave," Leaf River, Miss.

I have recorded the species as occurring in the Gatun formation of the Canal Zone.

Nonionina advena Cushman, n. sp.

Plate XXXII, figure 8.

Test small, circular in side view, biconvex; periphery rounded, nine to eleven chambers in the last-formed coil, inflated; sutures curved,

slightly sigmoid, the inner portion excavated and broadened; umbilical region at each side of the test occupied by a large projecting knob of clear shell material; aperture at the base of the last-formed chamber. Diameter 0.75 millimeter or less.

Type specimen from station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss. It also occurred at station 6447, Glass Bayou, Vicksburg, Miss.

This is an unusual form and may perhaps not belong to the genus *Nonionina*. It seems more like some species of *Polystomella*, but there appear to be no retral processes.

Family MILIOLIDAE.

Genus CORNUSPIRA Schultze, 1854.

Cornuspira involvens (Reuss) Reuss.

Operculina involvens Reuss, Akad. Wiss. Wien Denkschr., vol. 1, p. 370, pl. 45, fig. 30, 1849.
Cornuspira involvens (Reuss) Reuss, Akad. Wiss. Wien Sitzungsber., vol. 48, p. 39, pl. 1, fig. 2, 1863 (1864).
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 200, pl. 11, figs. 1–3, 1884.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 6, p. 25, pl. 1, fig. 2; pl. 2, fig. 2, 1917; U. S. Geol. Survey Prof. Paper 129, p. 101, pl. 25, fig. 1, 1922.

Specimens similar to the tropical form of this species occur at three stations, as follows:

6447. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.

The adults among these specimens are unlike the typical form of the species in having the last coil somewhat broadened and flattened, giving somewhat the appearance of *C. carinata* (Costa). The species was recorded from the Byram marl, but the specimens there were very small, measuring only 0.4 millimeter. Some of those from the Mint Spring marl measure 2 millimeters in diameter. This larger form of the species is common in the shoal waters of the Tropics, especially in the Indo-Pacific.

Genus SPIROLOCULINA D'Orbigny, 1826.

Spiroloculina imprimata Cushman.

Spiroloculina imprimata Cushman, U. S. Geol. Survey Prof. Paper 129, p. 101, pl. 25, figs. 3a, 3b, 1922.

Test broad and flat, complanate, nearly circular in outline, composed of numerous chambers, those of the last-formed coil failing to extend to the base of the preceding chamber, leaving a gap; periphery square, lateral faces nearly flat; the surface ornamented by a series of pits in a more or less linear arrangement. Length about 1 millimeter.

A single specimen, much like that from the Byram marl, already described, occurred at station 6451 (Mint Spring Bayou, Vicksburg, Miss.), but this species was not found elsewhere in the material from the Mint Spring marl.

Spiroloculina antillarum D'Orbigny.

Plate XXXIII, figure 1.

Spiroloculina antillarum D'Orbigny, in De la Sagra, Histoire physique, politique et naturelle de l'île de Cuba, Foraminifères, p. 166, pl. 9 figs. 3, 4, 1839.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 155, pl. 10, fig. 21, 1884.
Cushman, U. S. Geol. Survey Bull. 676, p. 21, pl. 8, fig. 2, 1918.
Spiroloculina grata Terquem, Soc. géol. France Mém., 3d ser., vol. 1, p. 55, pl. 5, figs. 14a–15b, 1878 (and subsequent authors).

Test elongate, twice as long as broad; chambers subtriangular; peripheral margin broadly rounded, ornamented by numerous longitudinal costae; apertural end extended. The costae are distinct and continue from one end to the other of the chambers without any trace of branching or anastomosing. Length 1 millimeter or less.

As noted in a paper on the recent Foraminifera from the shallow water of Jamaica[6] this species, described by D'Orbigny from specimens obtained in Cuba and other West Indian localities as *S. antillarum*, is very similar to Terquem's *S. grata*, if not identical, and has priority of date. Specimens from the Mint Spring marl are very close to this form now living in the West Indies; they were found at stations 6451 and 6452, Mint Spring Bayou, Vicksburg, Miss.

Genus VERTEBRALINA D'Orbigny, 1826.

Vertebralina sp.

A single specimen from station 6451 (Mint Spring Bayou, Vicksburg, Miss.) is evidently the young of a species of *Vertebralina*, but the specimen is worn and can not be specifically identified.

[6] Cushman, J. A., U. S. Nat. Mus. Proc., vol. 59, p. 63, pl. 14, figs. 14, 15, 1921.

Genus QUINQUELOCULINA D'Orbigny, 1826.

Quinqueloculina bicostata D'Orbigny.

Quinqueloculina bicostata D'Orbigny, in De la Sagra, Histoire physique, politique et naturelle de l'île de Cuba, Foraminifères, p. 195, pl. 12, figs. 8–10, 1839.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 6, p. 47, pl. 13, fig. 1, 1917; U. S. Geol. Survey Prof. Paper 129, p. 102, pl. 26, figs. 2–4, 1922.
Miliolina bicostata Heron-Allen and Earland, Zool. Soc. London Trans., vol. 20, p. 572, pl. 42, figs. 42–45, 1915.

The Mint Spring marl specimens referred to this species are considerably longer than those shown in D'Orbigny's type figures and resemble more those specimens from the Byram marl which I have referred to this species. These pecimens came from the following stations:

6448. Glass Bayou, Vicksburg, Miss.
6451. Mint Spring Bayou, Vicksburg, Miss.

Quinqueloculina cuvieriana D'Orbigny.

Quinqueloculina cuvieriana D'Orbigny, in De la Sagra, Histoire physique, politique et naturelle de l'île de Cuba, Foraminifères, p. 164, pl. 11, figs. 19–21, 1839.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 6, p. 47, pl. 12, fig. 2, 1917; U. S. Geol. Survey Prof. Paper 129, p. 102, pl. 26, fig. 1, 1922.

Test slightly longer than wide; chambers sharply angled, those of the adult with a secondary carina at each side of the periphery of the chamber; remainder of the surface smooth; aperture somewhat elongated with a simple tooth. Length 1 millimeter or less.

This species, which was found in the Byram marl, also occurred sparsely in the Mint Spring marl at the following stations:

6447. Glass Bayou, Vicksburg, Miss.
6452. Mint Spring Bayou, Vicksburg, Miss.

Quinqueloculina cookei Cushman, n. sp.

Plate XXXIII, figures 2, 3.

Test much elongate, somewhat fusiform; chambers narrow, widest near the base, rounded, apertural end extended, forming a subcylindrical neck with a simple tooth and slight lip; periphery of the test broad, carinate at each angle, slightly concave between the carinae; sutures distinct; surface smooth, shiny, except the carinae, which are dull. Length 1.5 millimeters or less, diameter 0.35 millimeter.

Type specimen from station 6451, Mint Spring Bayou, Vicksburg, Miss.

This species in some ways resembles *Q. bicostata*, but it is very elongate and slender, and its general form is entirely different.

Quinqueloculina vicksburgensis Cushman, n. sp.

Plate XXXIV, figure 6.

Quinqueloculina venusta Karrer? var., Cushman, U. S. Geol. Survey Prof. Paper 129, p. 102, pl. 26, fig. 5, 1922.

Test much elongate, narrow; chambers distinct; basal end broadly rounded, projecting; apertural end also projecting, forming a cylindrical neck and rounded aperture; periphery of the test subacute; surface smooth, dull. Length nearly 2 millimeters, width 0.5 millimeter.

Type specimens from station 6447, Glass Bayou, Vicksburg, Miss.

This is probably the same as the form recorded from the Byram marl as *Q. venusta* Karrer? var. It is a long, narrow species of peculiar form, as shown in the figure.

Quinqueloculina glabrata Cushman, n. sp.

Plate XXXIV, figure 8.

Test elongate, elliptical in side view, basal end of the chambers somewhat rounded; aperture slightly extending beyond the preceding chamber, aperture ovate with a simple tooth, tending to become bifid toward the tip; periphery of the test with an outside carina, the sides slightly concave; sutures distinct; surface smooth but not shiny. Length 1.5 millimeters, breadth 0.75 millimeter.

Type specimen from station 6447, Glass Bayou, Vicksburg, Miss. Several specimens of this species were also found at stations 6451 and 6452, Mint Spring Bayou, Vicksburg, Miss.

This species is very constant in its characters at all these stations.

Quinqueloculina lustra Cushman, n. sp.

Plate XXXIII, figure 6.

Test broadly elliptical, somewhat compressed; chambers broadly curved, of uniform width, at the basal end slightly projecting, the apertural end only slightly extending beyond

the outline of the chamber; surface smooth, shiny; sutures not very distinct; aperture nearly circular with a short, simple tooth. Length 1.25 millimeter, breadth 1 millimeter.

Type specimen from station 6448, Glass Bayou, Vicksburg, Miss.

This species has a peculiar rounded form, a smooth, shiny surface, and the periphery slightly angled.

Quinqueloculina tessellata Cushman, n. sp.

Plate XXXIII, figure 8; Plate XXXIV, figure 1.

Test elongate, fusiform, in transverse section much angled; periphery rather sharply angled, sides flat and very slightly convex, apertural end very little extended; sutures not very distinct; surface ornamented by longitudinal rows of rather large pits, five or six rows on each side of the largest chamber. Length 1.25 millimeters, breadth 0.5 millimeter.

Type specimen from station 6447, Glass Bayou, Vicksburg, Miss. This form also occurred at station 6451, Mint Spring Bayou, Vicksburg, Miss. It was rare at both stations.

This is a peculiarly ornamented species, reminding one somewhat of the pattern found in some of the Miliolidae of the Eocene of the Paris Basin.

Quinqueloculina vulgaris D'Orbigny.

Plate XXXII, figures 9, 10.

Quinqueloculina vulgaris D'Orbigny, Annales sci. nat., vol. 7, p. 302, No. 33, 1826.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 6, p. 46, pl. 11, fig. 3, 1917.
Miliolina vulgaris Heron-Allen and Earland, Zool. Soc. London Trans., vol. 20, p. 569, 1915.

Test short and stout, about as long as wide, in front view orbicular; chambers in transverse section roughly triangular, the periphery bluntly angled, sides straight or slightly convex; sutures distinct, wall smooth; apertural end not contracted or produced; aperture elongate, narrow, with a tooth bifid at the tip, in front view projecting slightly above the border of the aperture. Length about 0.75 millimeter.

Specimens were common in the Mint Spring marl at station 6448, Glass Bayou, Vicksburg, Miss., and less so at the following stations:

6447. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.

Quinqueloculina seminulum (Linnaeus) D'Orbigny.

Serpula seminulum Linnaeus, Systema naturae, 10th ed. p. 786, 1758; 13th ed. (Gmelin's), pp. 37, 39, 1788.
Quinqueloculina seminulum D'Orbigny, Annales sci. nat., vol. 7, p. 303, No. 44, 1826.
Cushman, U. S. Nat. Mus. Bull. 71, pt. 6, p. 44, pl. 11, fig. 2, 1917.
Miliolina seminulum Williamson, Recent Foraminifera of Great Britain, p. 85, pl. 7, figs. 183–185, 1858.
H. B. Brady, *Challenger* Rept., Zoology, vol. 9, p. 157, pl. 5, figs. 6a–c, 1884.

Test somewhat longer than broad, smooth, peripheral margins rounded; sutures distinct; apertural end not exserted; aperture fairly large, oval, with a simple tooth becoming bifid at the free end. Length 1.5 millimeters or less.

Specimens that may be referred to this common species were collected at three stations in the Mint Spring marl, as follows:

6447. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.

Quinqueloculina contorta D'Orbigny.

Plate XXXIV, figures 2, 3.

Quinqueloculina contorta D'Orbigny, Foraminifères fossiles du bassin tertiaire de Vienne, p. 298, pl. 20, figs. 406, 1846.

Test elongate, oval; chambers narrow, of uniform width; periphery flattened, especially in the middle; sides flat or slightly concave, very slightly if at all extended at the apertural end; aperture rounded with a simple tooth; sutures distinct; surface smooth, flattened, periphery dull, sides somewhat glossy. Length 1 millimeter or less.

Specimens that can be referred to this species were fairly common at four stations in the Mint Spring marl, as follows:

6447, 6448. Glass Bayou, Vicksburg, Miss.
6451, 6452. Mint Spring Bayou, Vicksburg, Miss.

This species was described by D'Orbigny in his report on the Foraminifera from the Tertiary Vienna Basin. Our specimens are very similar to those figured by him.

Quinqueloculina lamarckiana D'Orbigny.

Quinqueloculina lamarckiana D'Orbigny, in De la Sagra, Histoire physique, politique et naturelle de l'île de Cuba, Foraminifères, p. 187, pl. 11, figs. 14, 15, 1839.

Test short and broad; chambers with a sharp peripheral angle, sides slightly convex; aperature not produced; sutures distinct; surface smooth and shiny. Length 1 millimeter.

The only specimens from the Mint Spring marl that can be referred to this species were found at station 6447, Glass Bayou, Vicksburg, Miss.

Genus ARTICULINA D'Orbigny, 1826.

Articulina byramensis Cushman.

Articulina byramensis Cushman, U. S. Geol. Survey Prof. Paper 129, p. 103, pl. 27, figs. 5, 6, 1922.

Test of two portions, a basal triloculine portion followed by a single linear chamber, the earlier portion with the lip of the antepenultimate chamber standing out free at the base, that of the penultimate chamber covered by the base of the last-formed one, the last chamber rounded in transverse section or slightly compressed, with a broadly flaring, slightly downward curved lip; aperture rounded, slightly longer than wide; surface of the test with numerous longitudinal costae, sharp, sometimes, especially in the final chamber, anastomosing. Length 1.25 millimeters.

This species, which I have described and figured from specimens obtained in the Byram marl, also occurred in the Mint Spring marl at stations 6451 and 6452, Mint Spring Bayou, Vicksburg, Miss. The specimens are very similar to those from Byram, Miss., and show the specific characters.

Genus MASSILINA Schlumberger, 1893.

Massilina decorata Cushman, n. sp.

Plate XXXIV, figure 7.

Test much flattened, elliptical or oval, slightly longer than wide, basal and apertural ends projecting, the apertural end narrowed to a small cylindrical neck, nearly in the longitudinal axis of the test; sutures rather indistinct; surface dull white; periphery rounded, the sides ornamented by very fine pits, giving a finely granular appearance to the test. Length 1 millimeter or less.

Type specimens from station 6647, Chickasawhay River 1¼ miles southwest of Boice, Wayne County, Miss. This species also occurred at the following stations:

6452. Mint Spring Bayou, Vicksburg, Miss.
7671. "Brown's Cave," Leaf River, Miss.

This species in some ways resembles some of the specimens referred by Brady to *Spiroloculina tenuis* (Czjzek).

Genus TRILOCULINA D'Orbigny, 1826.

Triloculina peroblonga Cushman, n. sp.

Plate XXXIV, figures 4, 5.

Test much elongate, periphery rounded; chambers rounded at the base; the apertural end coming to or extending slightly beyond the base of the previous chamber; aperture rounded with a simple tooth and a slightly thickened lip; sutures distinct; wall dull white, smooth. Length 1.5 millimeters or less.

Type specimen from station 6451, Mint Spring Bayou, Vicksburg, Miss.

One of the specimens figured shows the aperture at each end, the last-formed chamber evidently having failed to cover the aperture of the preceding chamber, an unusual occurrence in this group.

Triloculina sculpturata Cushman, n. sp.

Plate XXXIII, figures 4, 5.

Test about twice as long as wide; periphery rounded or truncate; sutures indistinct; surface peculiarly sculptured, in general formed of longitudinal costae with broad surfaces, together with irregular connections, forming areolae; aperture rounded, with a simple tooth. Length 0.5 millimeter.

Type specimen from station 6451, Mint Spring Bayou, Vicksburg, Miss. This species was also found at station 6447, Glass Bayou, Vicksburg, Miss.

In its quinqueloculine stage this species has a somewhat extended neck, but in its adult character the aperture does not usually extend beyond the base of the previously formed chamber.

Genus BILOCULINA D'Orbigny, 1826.

Biloculina ornata D'Orbigny.

Plate XXXIII, figure 7.

Biloculina ornata D'Orbigny, Foraminifères fossiles du bassin tertiaire de Vienne, p. 266, pl. 16, figs. 7–9, 1846.

Test slightly longer than wide, each chamber broadest toward the basal end; aperture broadly rounded, the tooth somewhat bifid; surface smooth, dull. Length 0.40 millimeter.

Specimens that may be referred to this species occurred in the Mint Spring marl at stations 6451 and 6452, Mint Spring Bayou, Vicksburg, Miss.

PLATES XXIX-XXXV.

PLATE XXIX.

FIGURE 1. *Bolivina cookei* Cushman, n. sp. Front view of type specimen, × 120. Station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss.

2. *Bolivina vicksburgensis* Cushman, n. sp. Side view of type specimen, × 120. Station 6451, Mint Spring Bayou, Vicksburg, Miss.

3. *Bolivina frondea* Cushman, n. sp. Side view of type specimen, × 120. Station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss.

4. *Verneuilina rectimargo* Cushman, n. sp. View of flat face, × 100. Station 6451, Mint Spring Bayou, Vicksburg, Miss.

5. *Verneuilina rectimargo* Cushman, n. sp. View of two faces, × 100. Station 6447, Glass Bayou, Vicksburg, Miss.

6. *Gaudryina* sp. Front view, × 120. Station 6451, Mint Spring Bayou, Vicksburg, Miss.

7. *Bulimina pupoides* D'Orbigny. Side view, × 100. Station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss.

8. *Buliminella subteres* H. B. Brady var. *angusta* Cushman, n. var. Front view, × 120. Type specimen, station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss.

9. *Buliminella subteres* H. B. Brady var. *angusta* Cushman, n. var. × 120. Station 6447, Glass Bayou, Vicksburg, Miss.

10. *Lagena striata* (D'Orbigny) Reuss var. *substriata* Williamson. × 100. Station 7671, "Brown's Cave," Leaf River, Miss.

11. *Lagena orbignyana* (Seguenza) H. B. Brady var. *flintii* Cushman, n. var. Front view of type specimen, × 100. Station 6447, Glass Bayou, Vicksburg, Miss.

12. *Lagena hexagona* (Williamson) Siddall. Front view, × 100. Station 6452, Mint Spring Bayou, Vicksburg, Miss.

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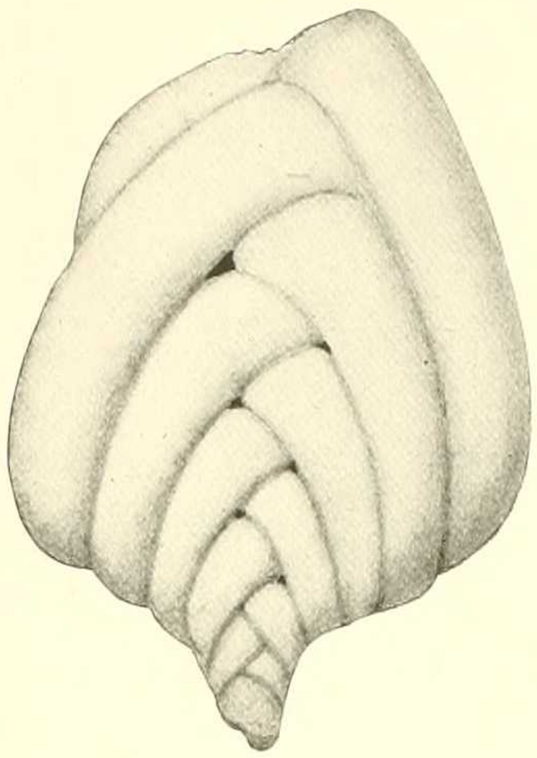

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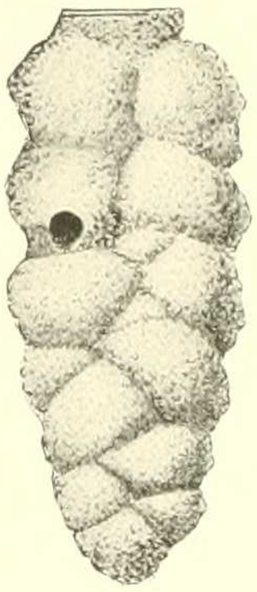

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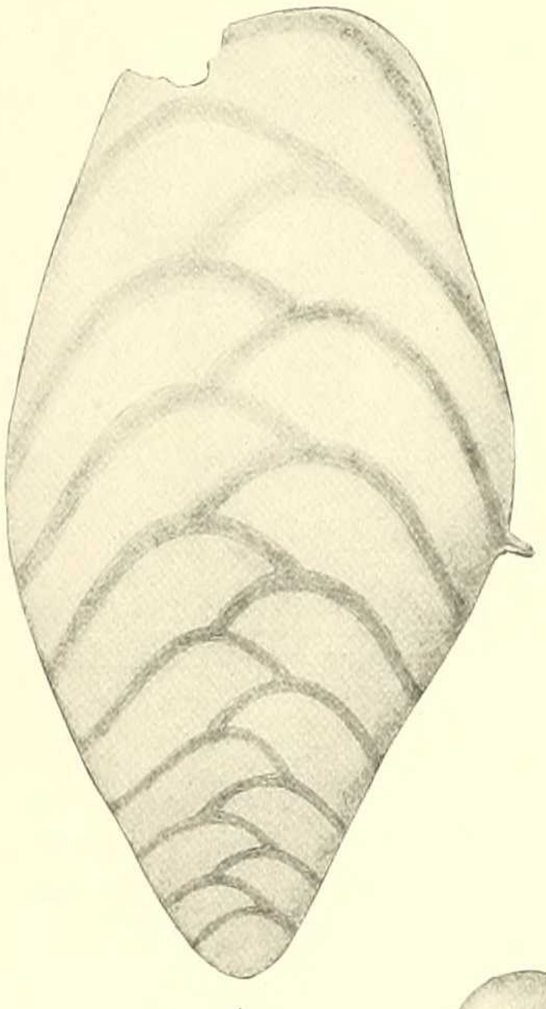

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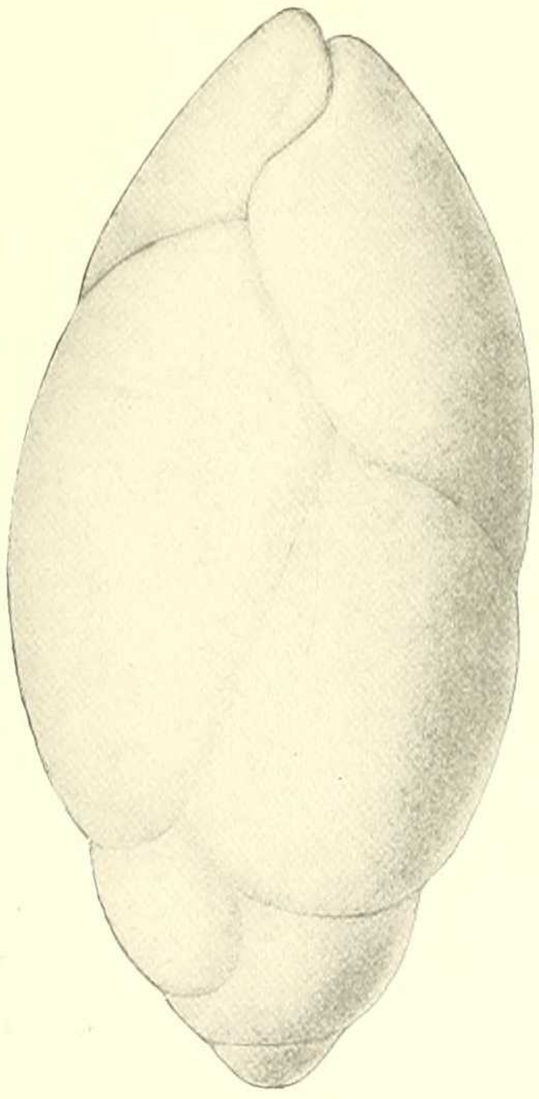

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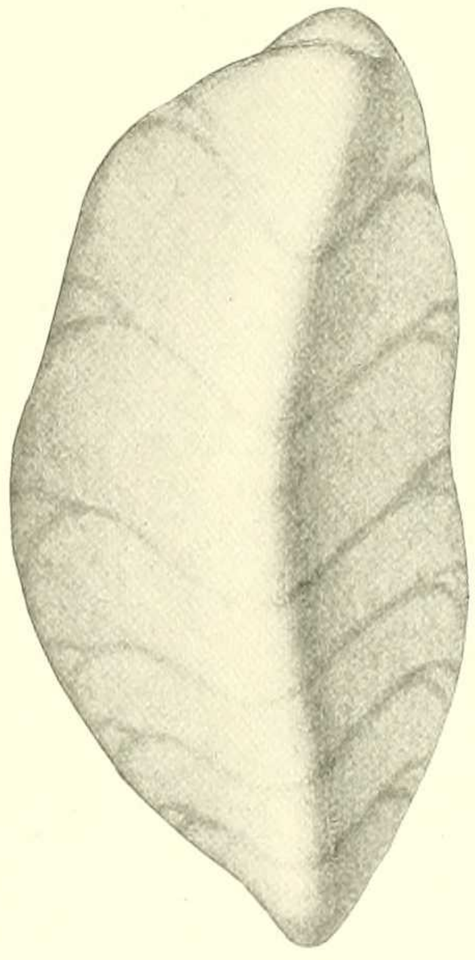

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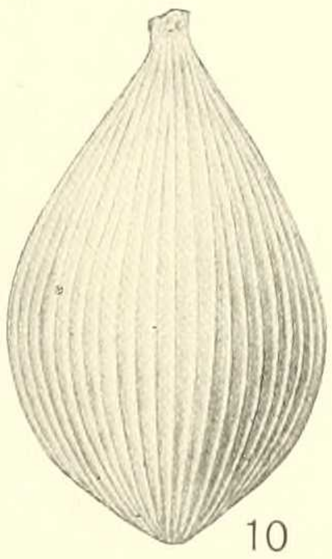

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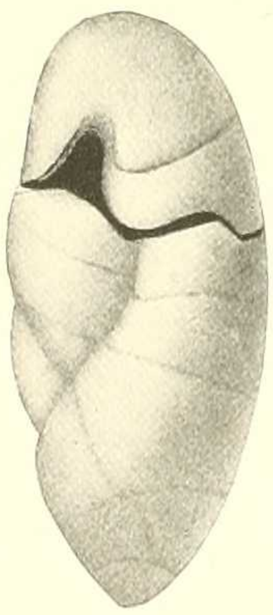

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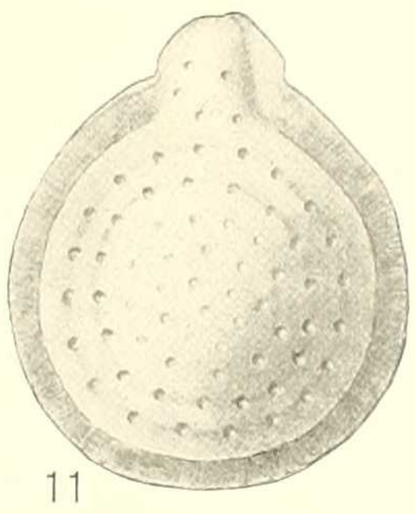

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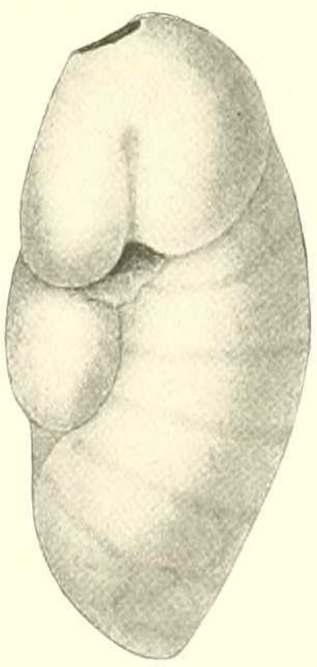

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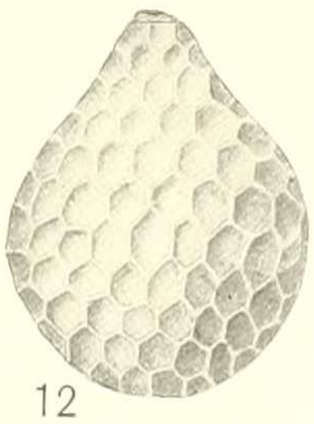

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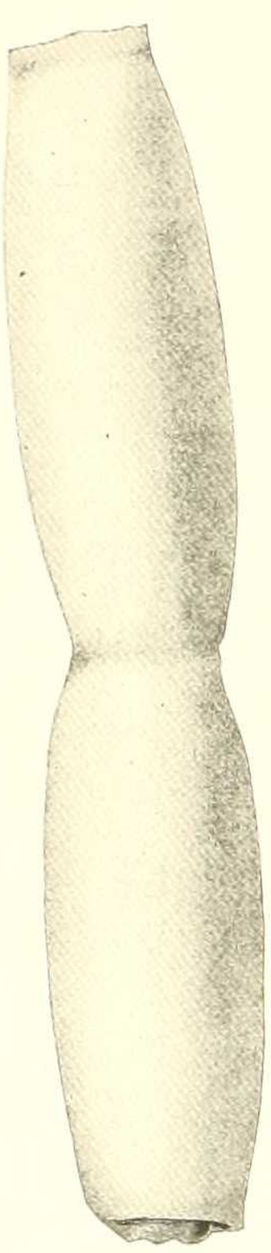
FORAMINIFERA OF THE MINT SPRING CALCAREOUS MARL.



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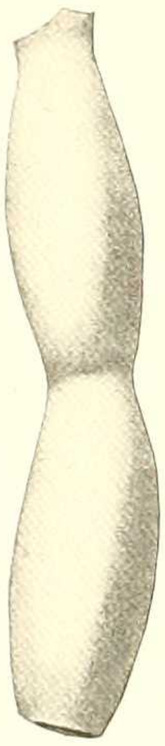

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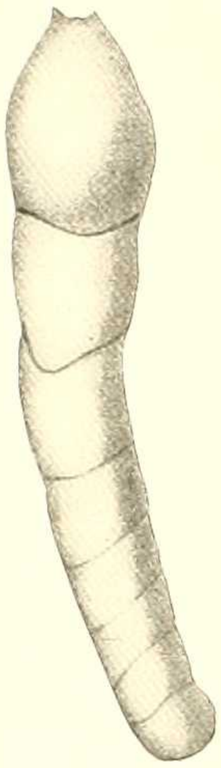

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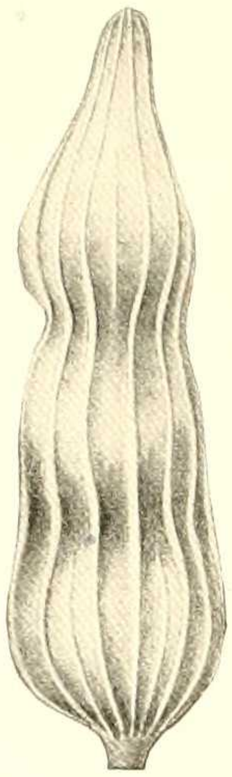

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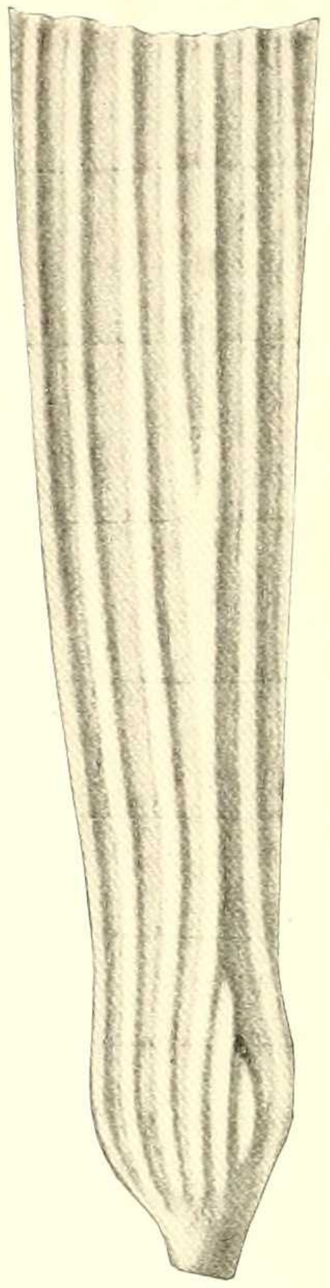

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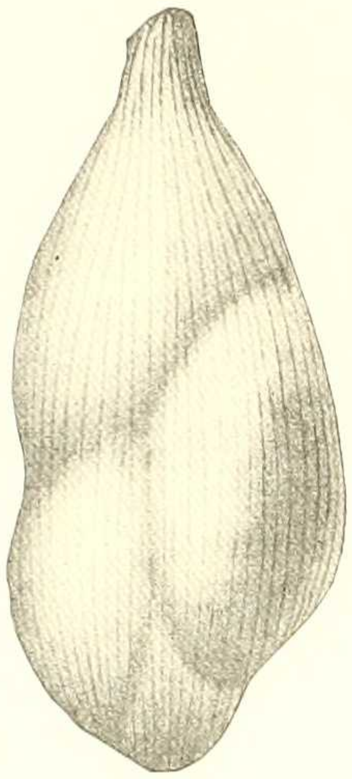

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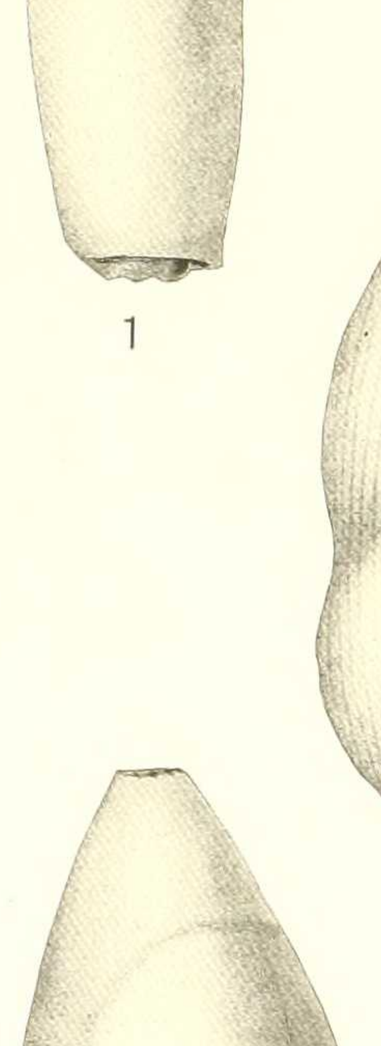

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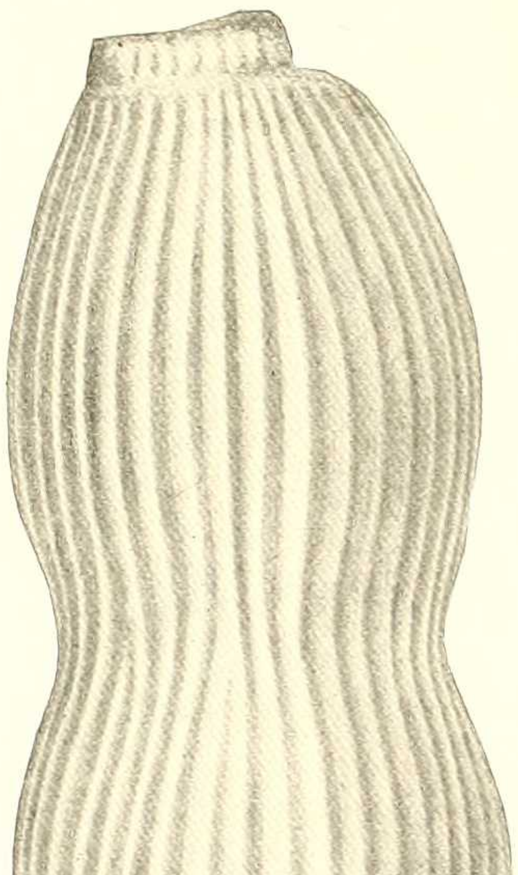

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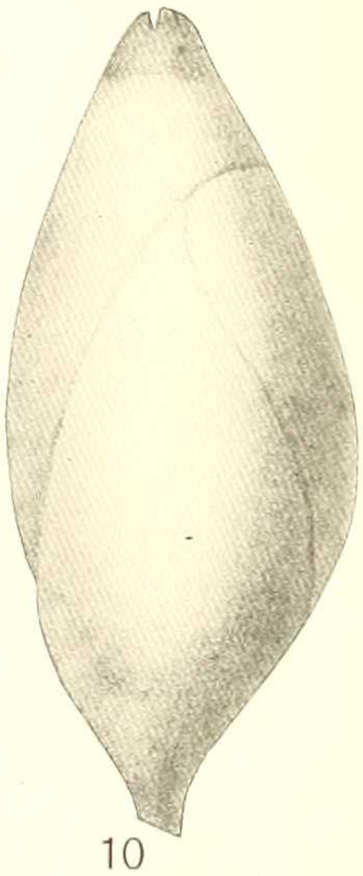

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FORAMINIFERA OF THE MINT SPRING CALCAREOUS MARL.

PLATE XXX.

FIGURE 1. *Nodosaria filiformis* D'Orbigny. Side view of two chambers, × 100. Station 6447, Glass Bayou, Vicksburg, Miss.

2. *Nodosaria filiformis* D'Orbigny. Side view of two chambers near the aperture, × 100. Station 7671, "Brown's Cave," Leaf River, Miss.

3. *Nodosaria filiformis* D'Orbigny. View of broken apertural end, × 100. Station 7671, "Brown's Cave," Leaf River, Miss.

4. *Nodosaria communis* D'Orbigny. × 100. Station 7671, "Brown's Cave," Leaf River, Miss.

5. *Nodosaria* sp. Side view, × 100. Station 7671, "Brown's Cave," Leaf River, Miss.

6. *Nodosaria obliqua* (Linnaeus) H. B. Brady. View of early portion of specimen, × 75. Station 7671, "Brown's Cave," Leaf River, Miss.

7. *Nodosaria obliqua* (Linnaeus) H. B. Brady. View of terminal portion of larger specimen, × 75. Station 7671, "Brown's Cave," Leaf River, Miss.

8. *Polymorphina regina* H. B. Brady, Parker, and Jones. Side view, × 125. Station 7671, "Brown's Cave," Leaf River, Miss.

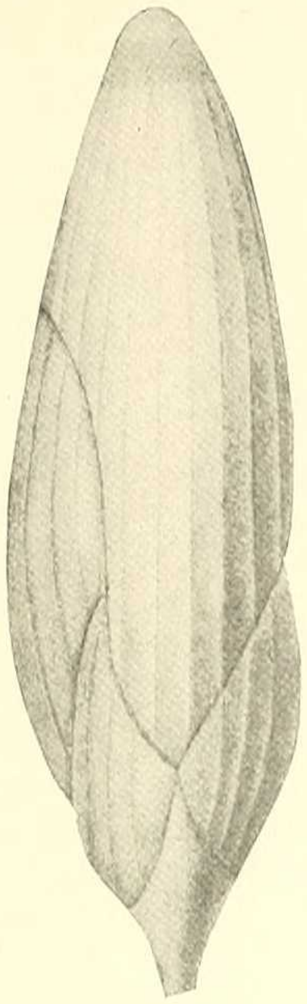
9. *Polymorphina cuspidata* H. B. Brady. Side view, × 125. Station 6447, Glass Bayou, Vicksburg, Miss.

10. *Polymorphina cuspidata* H. B. Brady. Side view, × 125. Station 6447, Glass Bayou, Vicksburg, Miss.

PLATE XXXI.

FIGURE 1. *Polymorphina cuspidata* H. B. Brady var. *costulata* Cushman, n. var. Front view of type specimen, × 125. Station 6452, Mint Spring Bayou, Vicksburg, Miss.

2. *Polymorphina vicksburgensis* Cushman, n. sp. Front view of type specimen, × 125. Station 6451, Mint Spring Bayou, Vicksburg, Miss.
3. *Polymorphina equalis* D'Orbigny. Front view, × 125. Station 6448, Glass Bayou, Vicksburg, Miss.
4. *Polymorphina advena* Cushman, n. sp. Front view of type specimen, × 125. Station 6451, Mint Spring Bayou, Vicksburg, Miss.
5. *Polymorphina spinosa* D'Orbigny, × 125. Station 7671, "Brown's Cave," Leaf River, Miss.
6. *Cristellaria vicksburgensis* Cushman, n. sp. Side view of type specimen, × 100. Station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss.
7. *Cristellaria vicksburgensis* Cushman, n. sp. Side view of more complete specimen, × 100. Station 7671, "Brown's Cave," Leaf River, Miss.
8. *Cristellaria cultrata* (Montfort) Parker and Jones. Side view, × 50. Station 7671, "Brown's Cave," Leaf River, Miss.
9. *Patellina advena* Cushman, n. sp. Dorsal view of type specimen, × 125. Station 6452, Mint Spring Bayou, Vicksburg, Miss.



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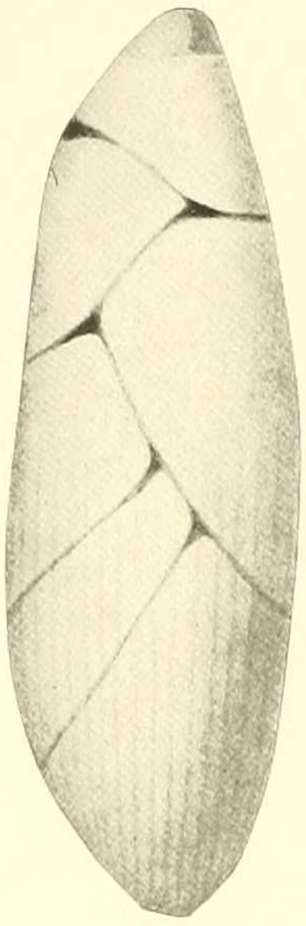

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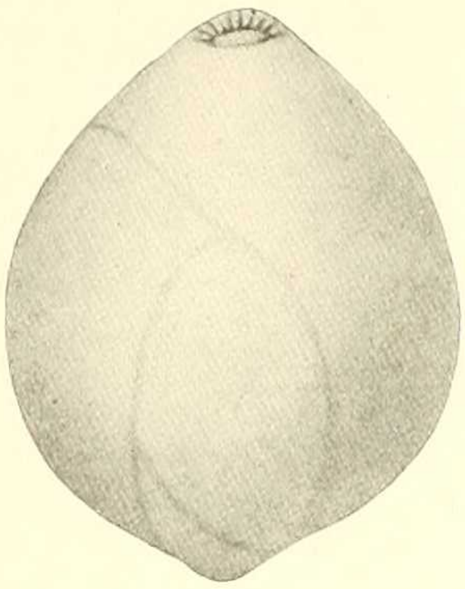

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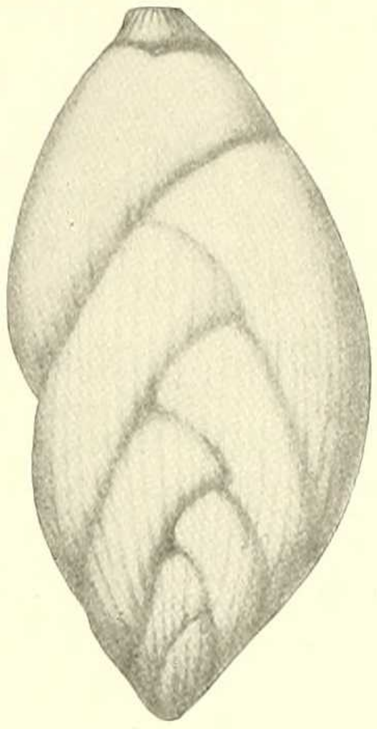

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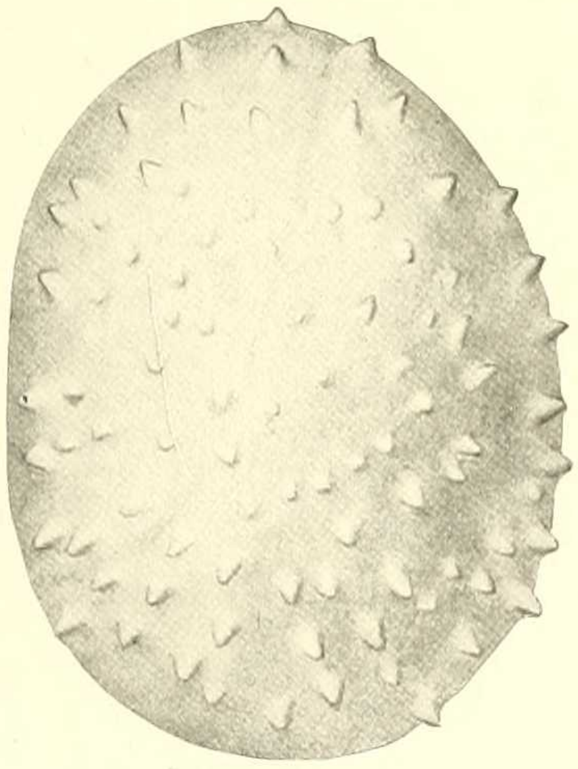

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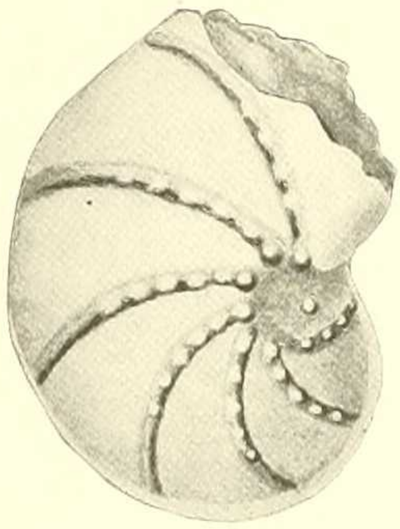

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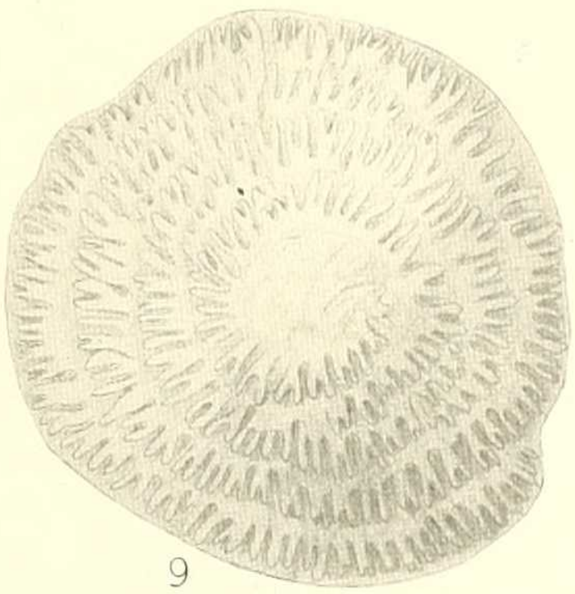

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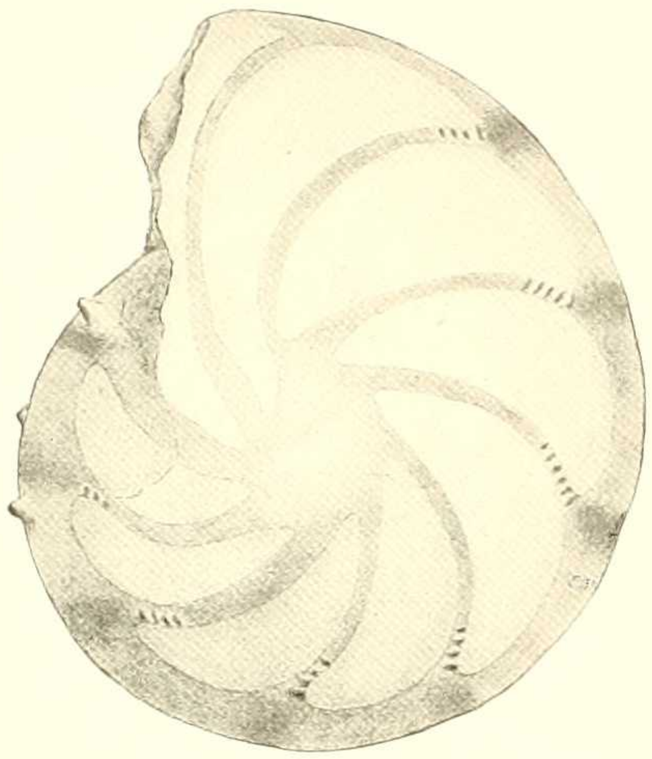
FORAMINIFERA OF THE MINT SPRING CALCAREOUS MARL.



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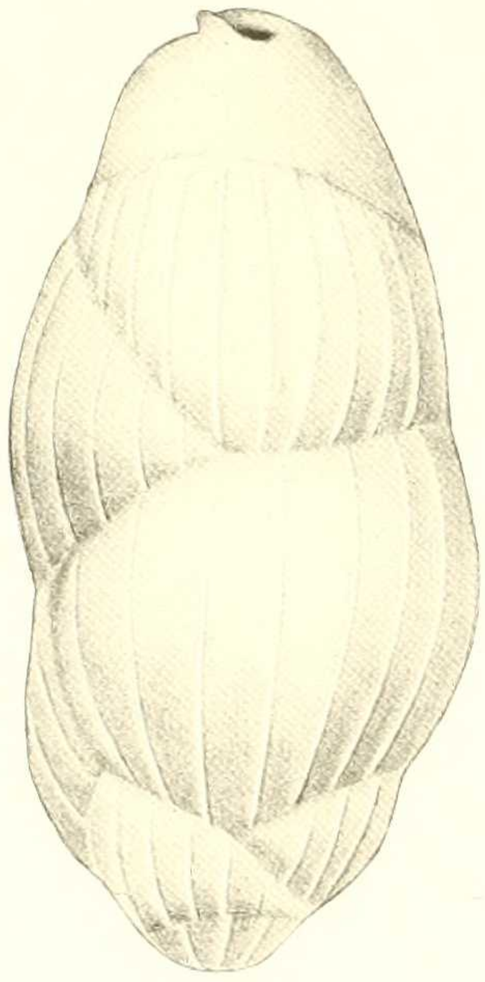

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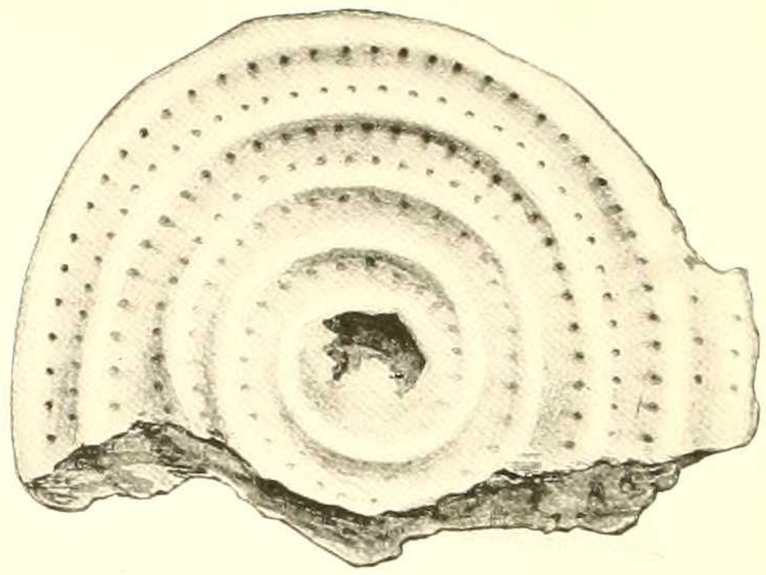

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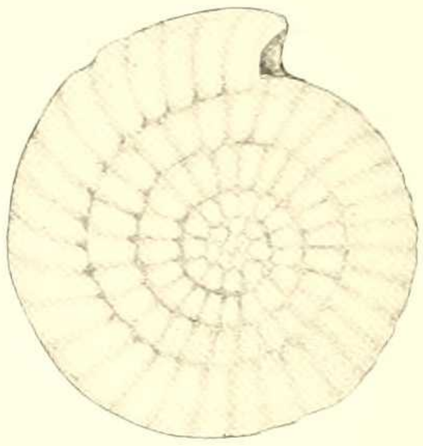

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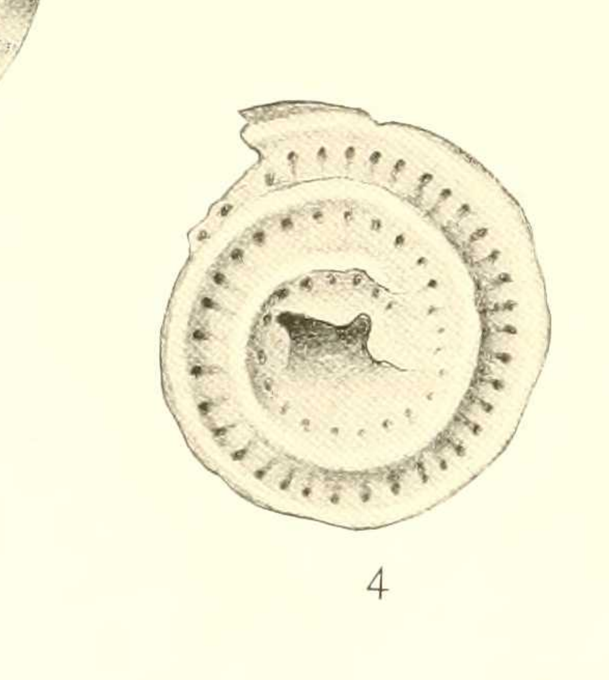

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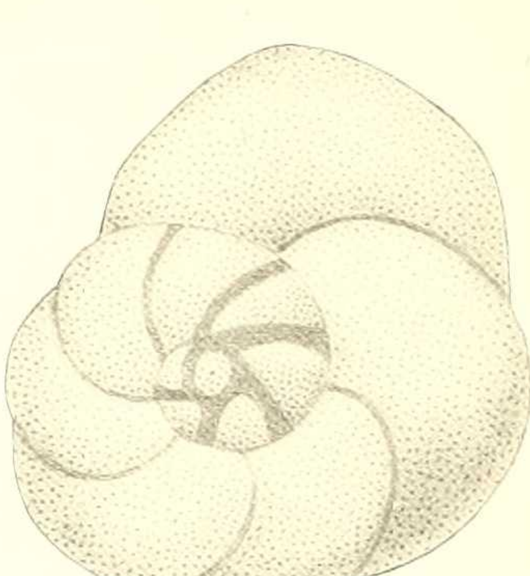

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FORAMINIFERA OF THE MINT SPRING CALCAREOUS MARL.

PLATE XXXII.

FIGURE 1. *Cristellaria rotulata* (Lamarck) D'Orbigny. Side view, × 50. Station 7671, "Brown's Cave," Leaf River, Miss.

2. *Uvigerina pigmea* D'Orbigny. Side view, × 125. Station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss.

3. *Spirillina limbata* H. B. Brady var. *bipunctata* Cushman, n. var. Dorsal view of type specimen, × 125. Station 7671, "Brown's Cave," Leaf River, Miss. Specimen showing the adult character of the double row of punctations.

4. *Spirillina limbata* H. B. Brady var. *bipunctata* Cushman, n. var. Dorsal view of young specimen, showing but a single row of punctations, × 125. Station 6447, Glass Bayou, Vicksburg, Miss.

5. *Spirillina limbata* H. B. Brady var. *bipunctata* Cushman, n. var. Ventral view, × 125. Station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss.

6. *Discorbis auracana* (D'Orbigny) Cushman. Ventral view, × 125. Station 6447, Glass Bayou, Vicksburg, Miss.

7. *Discorbis bertheloti* (D'Orbigny) Cushman. Dorsal view, × 125. Station 6451, Mint Spring Bayou, Vicksburg, Miss.

8. *Nonionina advena* Cushman, n. sp. Side view of type specimen, × 125. Station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss.

9. *Quinqueloculina vulgaris* D'Orbigny. Side view, × 125. Station 6448, Glass Bayou, Vicksburg, Miss.

10. *Quinqueloculina vulgaris* D'Orbigny. Side view of another specimen from the opposite side. Station 6448, Glass Bayou, Vicksburg, Miss.

PLATE XXXIII.

FIGURE 1. *Spiroloculina antillarum* D'Orbigny. Side view, × 125. Station 6451, Mint Spring Bayou, Vicksburg, Miss.

2. *Quinqueloculina cookei* Cushman, n. sp. Side view of type specimen, × 125. Station 6451, Mint Spring Bayou, Vicksburg, Miss.

3. *Quinqueloculina cookei* Cushman, n. sp. Side view of another specimen from opposite side, × 125. Station 6451, Mint Spring Bayou, Vicksburg, Miss.

4. *Triloculina sculpturata* Cushman, n. sp. Side view of type specimen, × 125. Station 6451, Mint Spring Bayou, Vicksburg, Miss.

5. *Triloculina sculpturata* Cushman, n. sp. Viewed from the side of the last-formed chamber, × 125. Station 6451, Mint Spring Bayou, Vicksburg, Miss.

6. *Quinqueloculina lustra* Cushman, n. sp. Side view of type specimen, × 125. Station 6448, Glass Bayou, Vicksburg, Miss.

7. *Biloculina inornata* D'Orbigny. Front view, × 100. Station 6452, Mint Spring Bayou, Vicksburg, Miss.

8. *Quinqueloculina tessellata* Cushman, n. sp. Side view of type specimen, × 125. Station 6447, Glass Bayou, Vicksburg, Miss.

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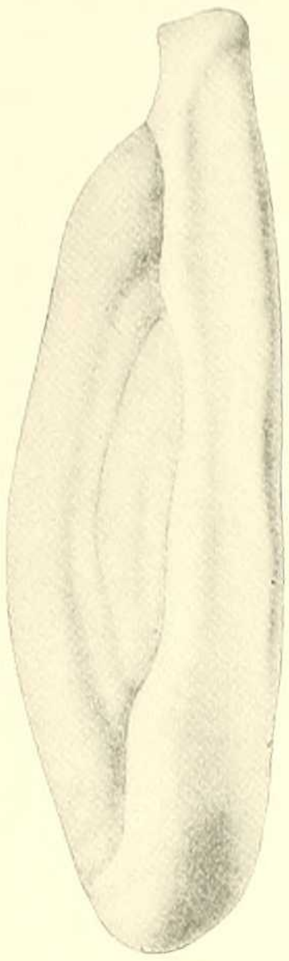

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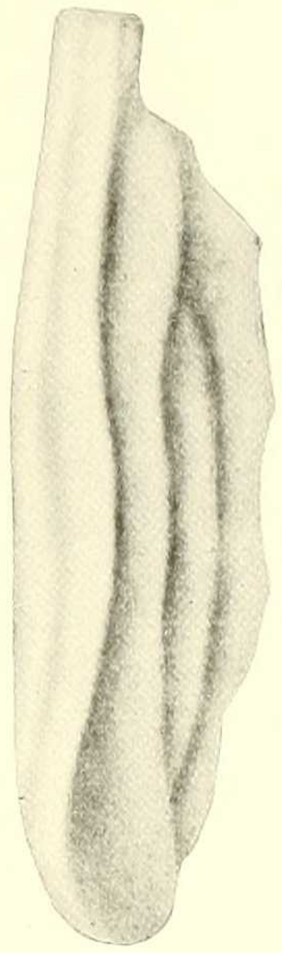

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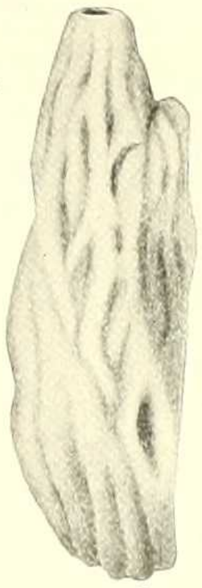

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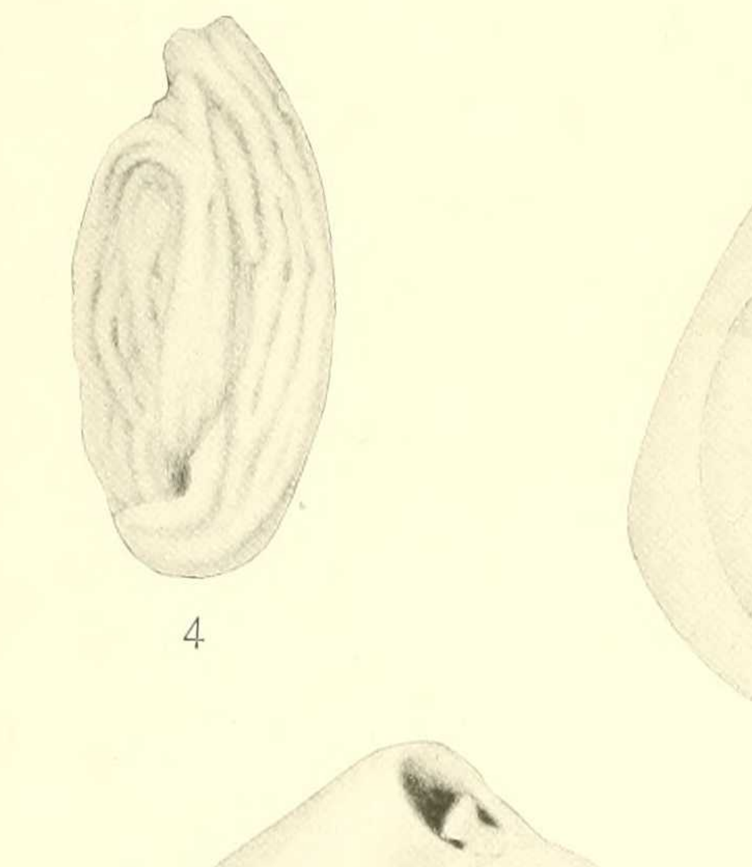

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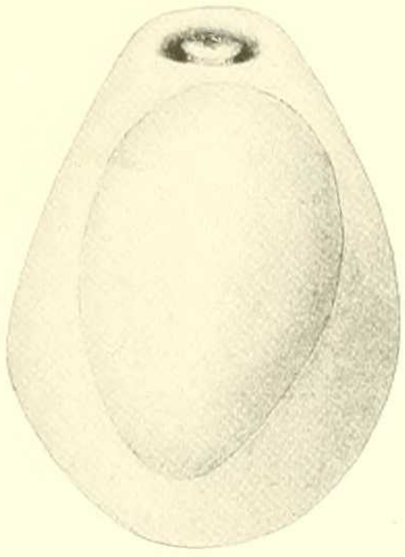

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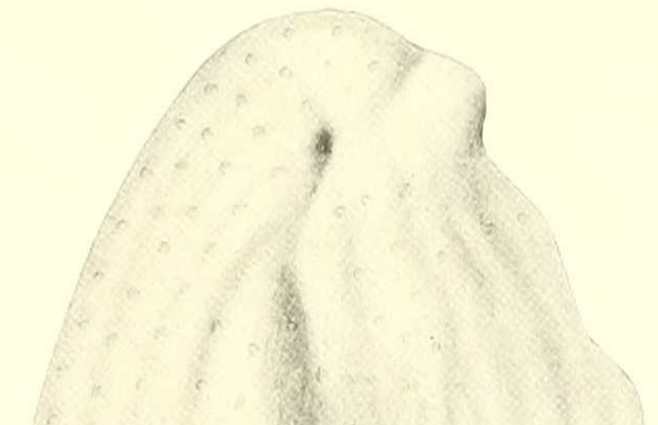
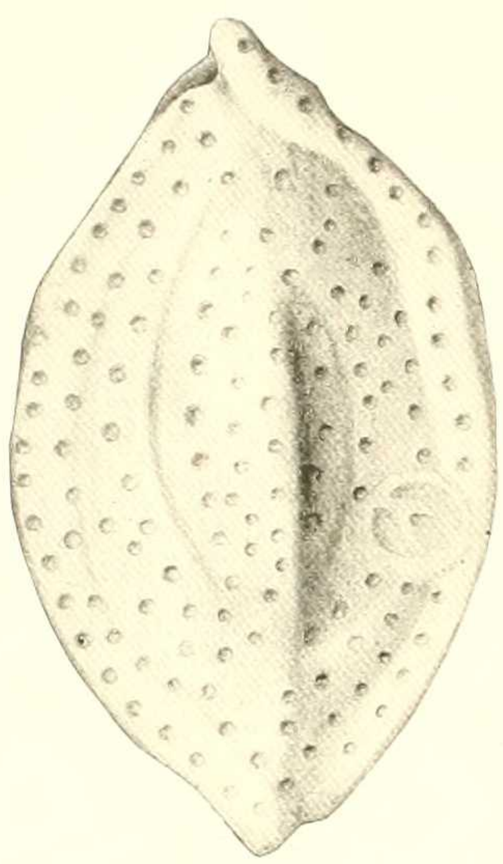


8

FORAMINIFERA OF THE MINT SPRING CALCAREOUS MARL.



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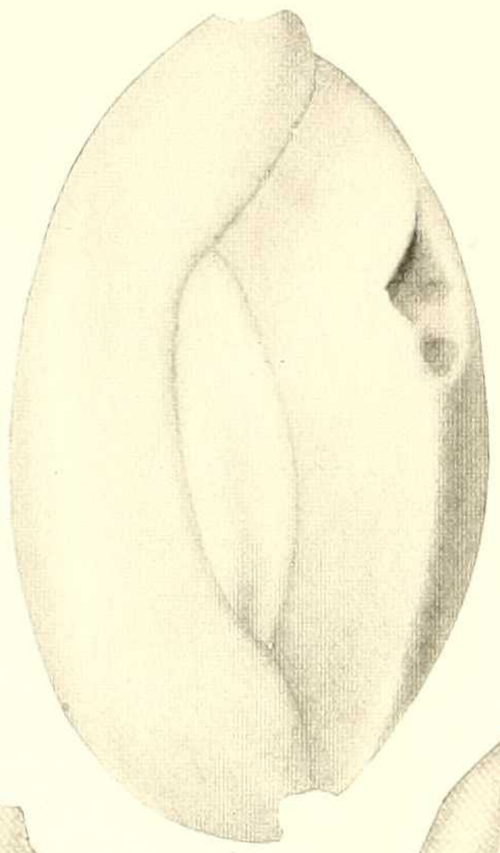

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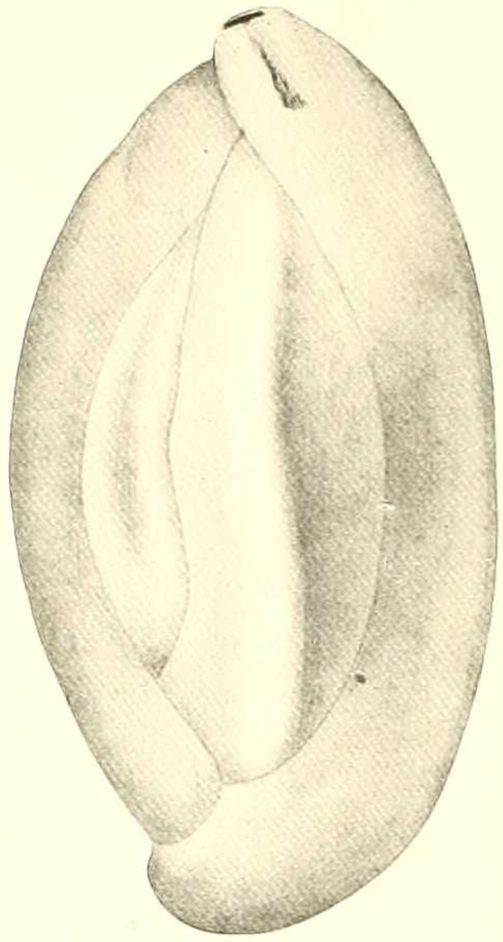

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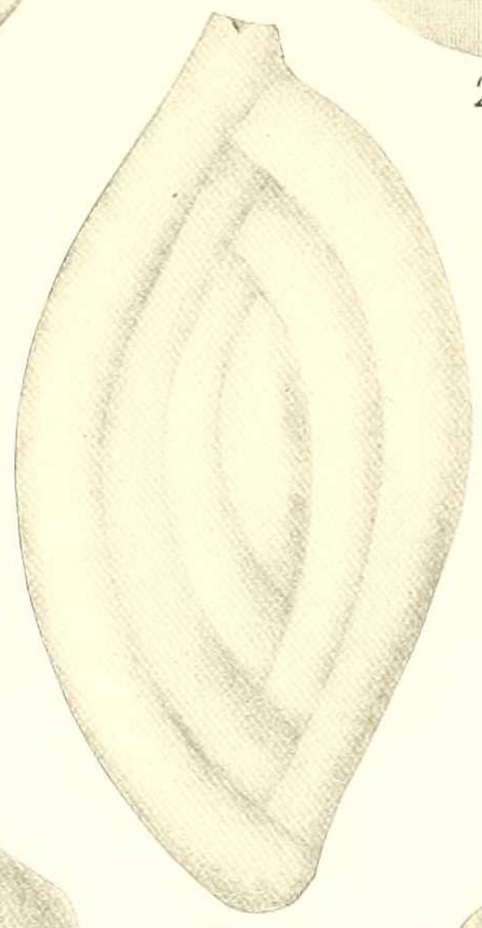

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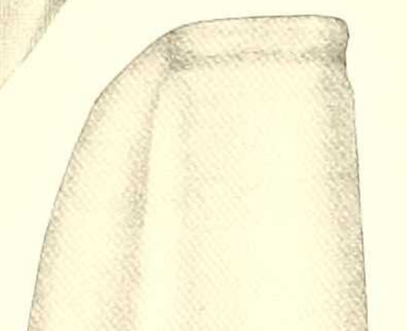

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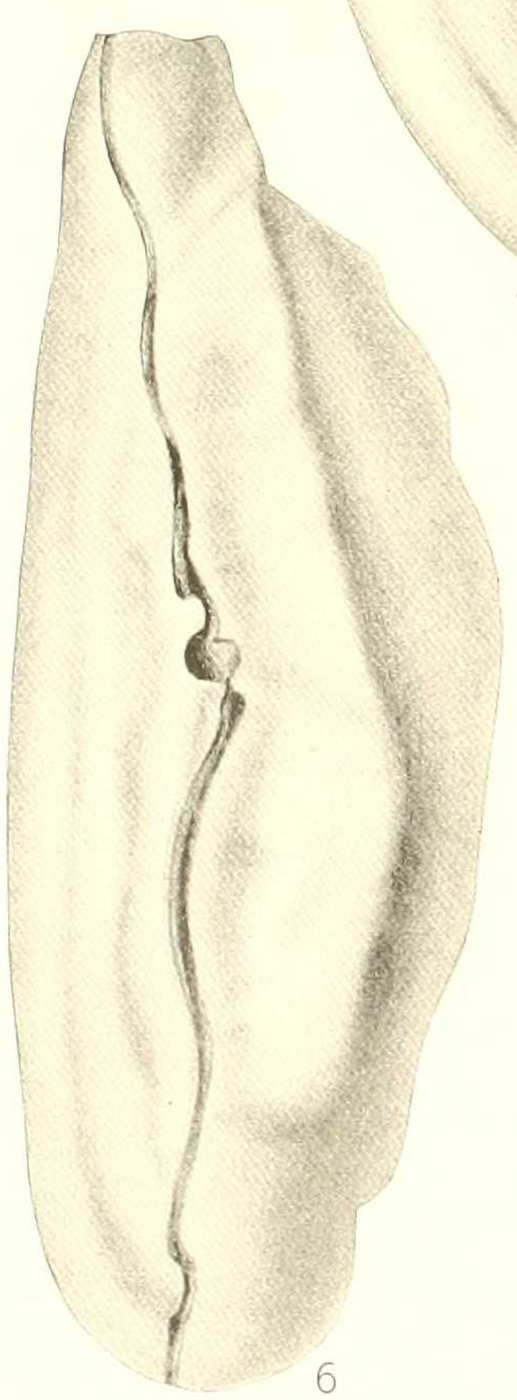

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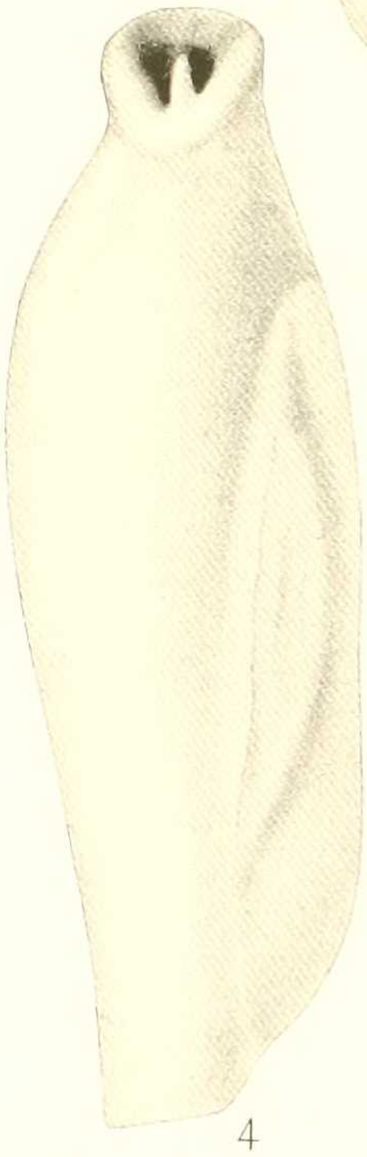

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8

FORAMINIFERA OF THE MINT SPRING CALCAREOUS MARL.

PLATE XXXIV.

FIGURE 1. *Quinqueloculina tessellata* Cushman, n. sp. Side view, × 125. Station 6451, Mint Spring Bayou, Vicksburg, Miss.

2. *Quinqueloculina contorta* D'Orbigny. Side view, × 125. Station 6448, Glass Bayou, Vicksburg, Miss.

3. *Quinqueloculina contorta* D'Orbigny. Side view, × 125. Station 6448, Glass Bayou, Vicksburg, Miss.

4. *Triloculina peroblonga* Cushman, n. sp. Specimen with double aperture, one at each end, through failure of the last-formed chamber to cover the preceding chamber completely, × 125. Station 6451, Mint Spring Bayou, Vicksburg, Miss.

5. *Triloculina peroblonga* Cushman, n. sp. Type specimen, × 125. Station 6451, Mint Spring Bayou, Vicksburg, Miss.

6. *Quinqueloculina vicksburgensis* Cushman, n. sp. Side view of type specimen, × 125. Station 6447, Glass Bayou, Vicksburg, Miss.

7. *Massilina decorata* Cushman, n. sp. Side view of type specimen, × 125. Station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss.

8. *Quinqueloculina glabrata* Cushman, n. sp. Side view of type specimen, × 125. Station 6447, Glass Bayou, Vicksburg, Miss.

PLATE XXXV.

FIGURE 1. *Rotalia dentata* Parker and Jones var. *parva* Cushman, n. var. Ventral view, × 100. Station 6451, Mint Spring Bayou, Vicksburg, Miss.

2. *Rotalia dentata* Parker and Jones var. *parva* Cushman, n. var. Dorsal view, × 100. Station 6448, Glass Bayou, Vicksburg, Miss.

3. *Rotalia vicksburgensis* Cushman, n. sp. Ventral view, × 100. Station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss.

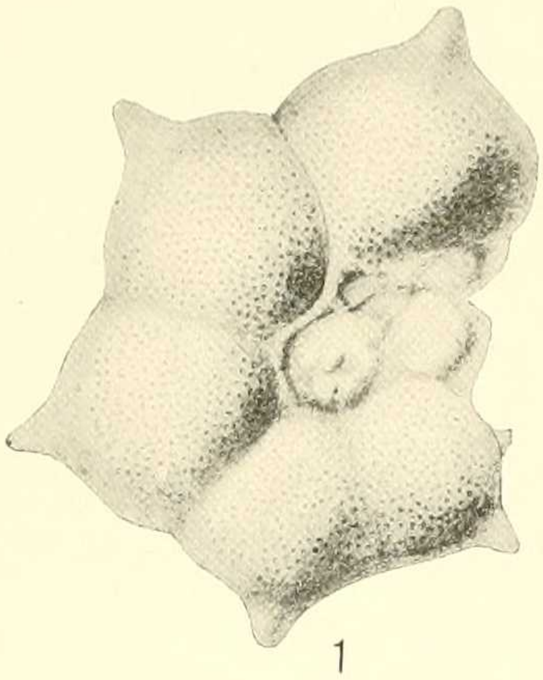
4. *Rotalia vicksburgensis* Cushman, n. sp. Dorsal view, × 100. Station 6647, Chickasawhay River 1¼ miles southwest of Boice, Miss.

5. *Anomalina vicksburgensis* Cushman, n. sp. Dorsal view, × 100. Station 6452, Mint Spring Bayou, Vicksburg, Miss.

6. *Anomalina vicksburgensis* Cushman, n. sp. Ventral view, × 100. Station 6452, Mint Spring Bayou, Vicksburg, Miss.

7. *Truncatulina vicksburgensis* Cushman, n. sp. Dorsal view, × 100. Station 6448, Glass Bayou, Vicksburg, Miss.

8. *Truncatulina vicksburgensis* Cushman, n. sp. Ventral view, × 100. Station 6448, Grass Bayou, Vicksburg, Miss.



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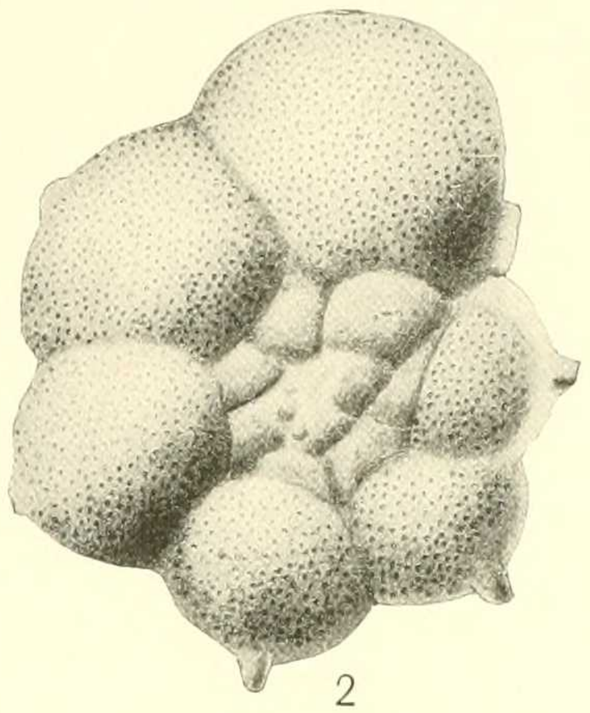

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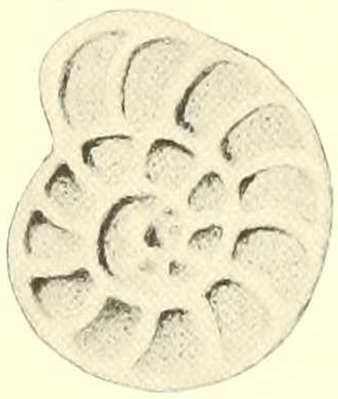

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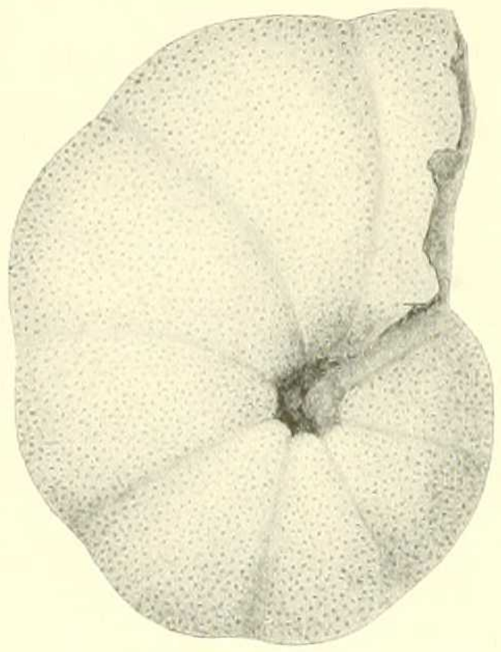

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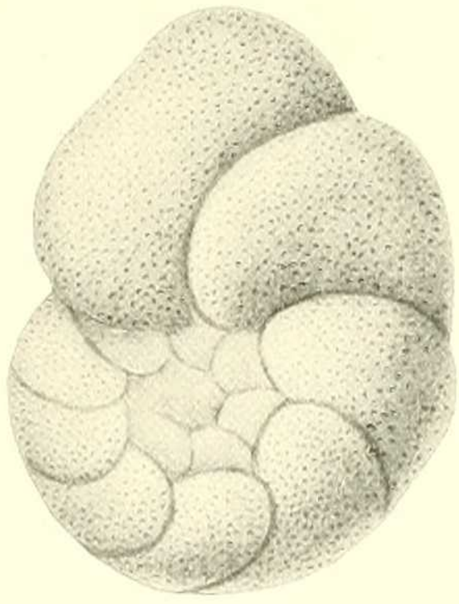

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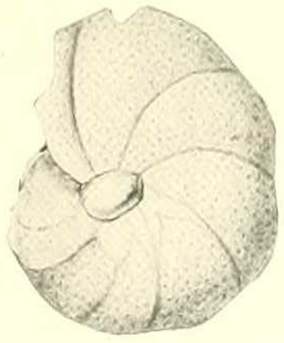

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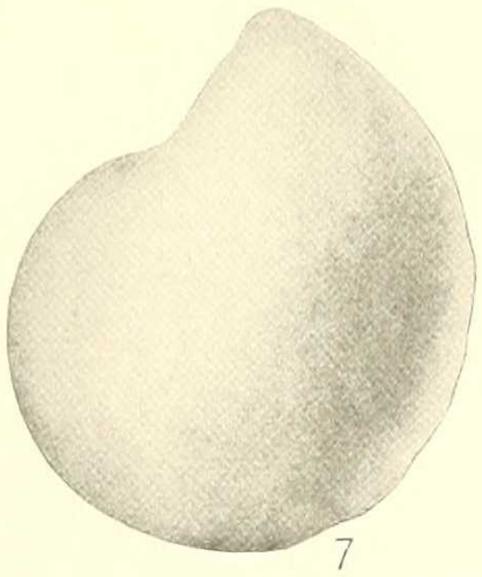

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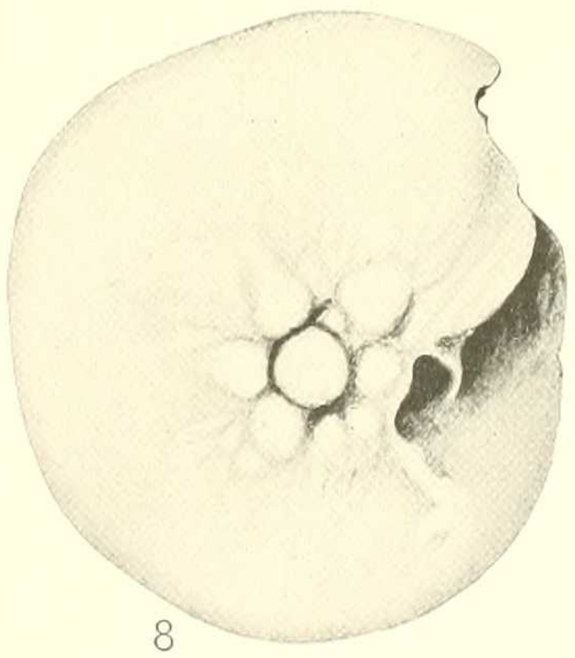

8

FORAMINIFERA OF THE MINT SPRING CALCAREOUS MARL.

INDEX.

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Professional Paper 129

SHORTER CONTRIBUTIONS TO GENERAL GEOLOGY

1921

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1922

CONTENTS.

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