limestone, *Spirifer glaber* var. *contractus* M. & W., 1009, *Spiriferina spinosa*; 1012, *Chonetes Illinoisensis* W., *Productus parvus* M. & W.

(*c*) *Lamellibranchs.* —**Kinderhook** l.: *Cardiopsis radiata* M. & W. **Burlington** l.: *Aviculopecten Burlingtonensis* M. & W., Iowa. **Keokuk** l.: *Aviculopecten Oweni*, *A. oblongus*, *A. amplus*, of M. & W., Ill. **St. Louis** l.: *Myalina concentrica* M. &. W., *Nucula Shumardana* H., Warsaw, Idaho, *N. nasuta* H., ibid., *Conocardium Meekanum* H., ibid. **Chester** l.: *Pinna Missouriensis* Swallow, Ill., *Myalina angulata* M. & W., Ill., *Schizodus Chesterensis* M. & W., Ill.

(*d*) *Gastropods.* — **Kinderhook** l.: *Straparollus lens* H., Goniatite bed, Ind., *Bellerophon cyrtolites* H., ibid. **Burlington** l.: *Platyceras reversum* H., Iowa. **Keokuk** l.: *Pleurotomaria Shumardi* M. & W., Ill., *Platyceras equilaterale* H., Iowa. **St. Louis** l.: *Dentalium venustum* M. & W., Ill., *Straparollus similis* M. & W., Spergen Hill, Ind., *S. Spergensis* H., ibid.

6. **Vertebrates.** — *Fishes.* — The species of American Subcarboniferous Fishes have been described mainly by Newberry, Newberry and Worthen, and St. John and Worthen in the Ohio and Illinois Geol. Reports. The species described by Newberry and Worthen, from Illinois specimens, include 16 of Hybodonts, 26 of Petalodonts, 52 of Cestracionts, with 9 of fin-spines and Psammodonts. St. John and Worthen have added over 50 species of Cochliodonts, a dozen of Psammodonts, and over 20 kinds of fin-spines (*Ill. Geol. Rep.*, vol. vii., 1883). Fig. 1018, tooth of *Cochliodus nobilis* N. & W., Ill.; 1021, *Cladodus spinosus* N. & W., St. Louis l., Mo.; *a*, section of the same; 1020, *Carcharopsis Wortheni* Newb., Huntsville, Ala.; 1022, *Orodus mammillaris* N. & W., Warsaw, Ill. The Subcarboniferous at Ogden has afforded a tooth of a species of *Dendrodus*.

## 2. Carboniferous Period.

Since the Carboniferous period, or that of the Coal-measures, was a period largely of marshes, as it opened the land gradually became emerged; and the first rocks that were laid down bear evidence, in many regions, of the change of condition by their beach-like character. Other evidence of the transition epoch exists in erosions over the Subcarboniferous rocks, making a surface of hills and depressions for the reception of the later depositions. Part of this irregularity may be the work of denudation before the Subcarboniferous period had closed; but other parts are referred to the time of emergence.

### ROCKS — SUBDIVISIONS, KINDS, AND DISTRIBUTION.

The most prominent subdivisions of the Carboniferous formations are those of (1) the Millstone grit, or the Great conglomerate, named, in Pennsylvania, the Pottsville Conglomerate; and (2) the Coal-measures.

### THE POTTSVILLE CONGLOMERATE.

The conglomerate beneath the coal-measures is generally a hard gritty siliceous rock, made of quartzose gravel or sand — a rock that was literally a *millstone grit* early in the century. It has a thickness of 800 to 1700 feet in the center of the Anthracite region of Pennsylvania, but thins northward in this state to less than 300 feet in the Wilkesbarre region, and westward to 200–300 feet. Its lower part spreads northward into western New York and constitutes there the "Olean conglomerate" of Alleghany and Cattaraugus counties, the rock of "Rock City," 25 to 60 feet thick. It extends westward