The larva of the cycadia of different kinds, during their long period of life under ground, must do much toward pulverizing the soil. The larva of some of the tipulidæ, or crane flies, are among the most effective of these minor agencies. I found them last season working in shale and bowlder clay. These materials were honey-combed to a depth of about three inches below the level of the water, and so well was the work done that the mass broke down easily in the fingers. The materials removed in boring their tubes was quickly dissolved or washed away, and penetrating the holes the water rapidly dissolved the partitions or so weakened them that even a gentle current carried away the shale and clay in great quantities.

Many different kinds of ants burrow in the ground often ranging over large areas. The amount of soil worked over each year by these little laborers must be very great. Then there are several kinds of wasps which work more or less extensively in the soil. Some of the bees also work in the ground, or in banks much like cliff swallows. They deposit their eggs at the bottom of a hole or burrow some two or three inches deep. Often they build out an entrance or porch to the hole, possibly as a protection against intruders. Their work breaks up large areas of material each season for the rains of spring and autumn to dissolve and carry away. Many other insects are engaged in this work, but the ones mentioned are perhaps the more important. These little fellows are among the minor agencies of erosion, but the amount of work accomplished each year is immense and can not be neglected in a careful study of erosion and erosive agents. In nearly every case the action of these little animals serves to enrich and fertilize the soil, thus promoting the growth of vegetation while aiding in erosion.

KETTLE HOLES NEAR LAKE MAXINKUCKEE. By J. T. Scoville.

Kettle holes are phenomena incident to the retreat of glacial ice. They are very numerous in southeastern Massachusetts and are abundant throughout the glaciated area wherever the ice halted long enough to form morainic deposits. They vary greatly in size, but are usually somewhat conical in shape. They are often occupied by water forming ponds or small lakes. There are said to be more than 300 such bodies of water in Plymouth Township, Massachusetts. In many cases, however, their walls are of sand or gravel, which do not retain water for any great length of time, so that they are usually dry. The holes are supposed to have been formed somewhat as follows: The clay, sand, gravel and other morainic materials along the margin of the ice were irregularly distributed so that in some places it was so thick as to protect the ice underneath from the

action of the sun until the ice on all sides had disappeared leaving an island or detached portion of ice, thickly covered with rocky fragments, and often surrounded by a deep layer of similar material left by the more rapidly melting ice. The drainage channels abundant along the margin of the ice sheet often aided no doubt in detaching such blocks of ice.

As these masses melted down, their loads of debris would shoot down the sides, forming a rim, while the core, as it melted, would leave a hole or cavity, often reaching much below the general level of the surface.

Kettle holes are so characteristic in form that they may be easily recognized, and are indications of morainic materials that almost anybody can appreciate and understand. On the west side of Lake Maxinkuckee, between Marmont and the Arlington station there are seven or eight kettle holes ranging from 100 to 300 feet in diameter and from 4 or 5 feet to 25 feet in depth. Some have been partially cut away by the lake, others are quite perfect. One near the end of Long Point has been about one-half cut away, and the big ice house of Holt & Co. occupies a portion of an old kettle hole. The lake itself doubtless occupies a portion of an old drainage channel, the deeper portions being simply old kettle holes. It is interesting to study these remains or relics of the glacier, so symmetrical in form, so perfect in outline that they seem as if made but yesterday, as if fresh from the hand of the builder, making one feel sure that the ice is just over them a little way, and that the hills have just barely had time to clothe themselves with verdure since the ice king yielded up his scepter to the sun.

A Relief Map of Arkansas. By T. F. Newson.

[Abstract.]

In 1893 Dr. J. C. Branner constructed a relief map of Arkansas for the Arkansas exhibit at the World's Fair. The horizontal scale used was three miles to the inch; the vertical scale was 2,000 feet to the inch.

Topographic maps of the entire State were first made. These were cut into sections, and placed on small blocks cut to fit them. Pins were driven through the sections at prominent points, and were then cut to the proper vertical scale. These pins were the guiding points in molding the map, which was done in ordinary molders' clay. After being molded the separate blocks were fitted together, forming the complete model of clay, from which a plaster of Paris negative was cast. From the negative the positive or final cast of the map was made.