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RECENT DEVELOPMENTS IN THE DUBUQUE LEAD AND ZINC MINES.

BY A. G. LEONARD.

During the past year or two there have been some important developments in the Dubuque district. New lead mines have been opened up, new ore bodies have been discovered, and the Durango zinc mine, the largest in the state, has been still further developed.

About one mile west of the city is located the mine of the Dubuque Lead Mining company, which has been worked only about a year and a half. It is on the west end of the old level range which has been followed for nearly three miles and has yielded considerable ore from various points along its length. When the mine was visited in November, 1895, there were seventy-five men employed and the place presented a lively appearance. The three shafts are 210 feet deep with a steam hoist on one and gins on the other two. The company has just erected a concentrator at the mine for the purpose of crushing and cleaning the ore. This was made necessary by the fact that in this mine much of the Galena occurs scattered through the rock, sometimes in particles of considerable size. The limestone is crushed and the lead then separated from it by washing. The ore-bearing dolomite forms a zone from two to four feet wide and contains an abundance of iron pyrites. This latter mineral is often found here crystallized in beautiful octahedrons with a length of from one-fourth to three-fourths of an inch. Besides being disseminated through the rock the Galena occurs in large masses in what is probably the fourth opening, and it likewise fills the crevice above for some distance. The ore body is apparently an extensive one; 700,000 pounds of lead have already been raised. Work in this mine is made possible only by the constant operation of a steam pump which keeps the water below the opening where the ore occurs and thus allows the miners to reach the deposits.

The extensive zinc mine at Durango, five miles northwest of Dubuque, has several points of special interest. The timber range on which the diggings are located was once well known as a large lead producer. The range has a width of 100 feet, and is formed by three main crevices, with a general direction S. 80° E. The openings occur ninety feet below the crown of the hill, and where they are enlarged the three fissures unite in caverns of immense size. In these openings the lead occurred, and above them, extending to the surface, the hill is filled with zinc carbonate. The zinc is known to extend also below the level of the lead. The mine is worked by means of an open cut extending through the hill, with a width of forty feet and a depth of about eighty feet. The crevices are more or less open up to the surface. Several can be seen in the face of the cut, and in them the ore is most abundant, though it is also found mixed all through the fractured limestone. The strata have been subjected to more or less strain, possibly owing to the large caves below, and are broken into fragments. The carbonate is found coating these pieces and filling the spaces between, occurring also, as stated, in the open crevices. The latter have a width of from one to two feet. In working the mine the larger masses are blasted and the smaller ones loosened with the pick. The ore is removed from the rock, the latter is carted off to the dump, and the dry bone, mixed with more or less waste material, is carried to a neighboring stream. Here it is washed by an ingenious contrivance which thoroughly frees the ore from all sand and dirt. The method was invented by Mr. Goldthorp, superintendent of the mine, and is quite extensively used about Dubuque. An Archimedes screw, turned by horse power, revolves in a trough through which a stream of water is kept flowing. As the screw revolves it gradually works the ore up the gentle incline, while the water runs down and carries with it all sand and dirt. Afterwards the dry bone is picked over by hand and the rock fragments thus separated.

During the past season eighteen men were employed at the mine and the daily output was from fifteen to eighteen tons of ore. This would mean a yield of over 2,500 tons for six months, and is probably about the annual production of the mine during the last few years.

Most of the zinc mines have been closed for nearly two years on account of the low price paid for the carbonate, the average being only \$5 to \$6 per ton the past year. About 800 tons

were, however, sold at these figures. There are very large quantities of ore in sight in these mines, as even a brief inspection clearly shows, and they are capable of yielding thousands of tons for some years to come.

The output of the mines for the past year can be given only approximately. They have produced about 750,000 pounds of lead and from 3,000 to 3,500 tons of zinc. But it must be remembered that, as already stated, most of the zinc mines were closed during the past season. They are easily capable of yielding from 8,000 to 10,000 tons of ore annually.

THE AREA OF SLATE NEAR NASHUA, N. H.

BY J. L. TILTON.

OUTLINE.

Maps of Crosby and Hitchcock.

The area briefly outlined.

Description of the slate area.

Description of the rocks.

Section from Nashua northward.

Section along the Massachusetts line.

Section west of Hollis Center.

Section east from Runnells Bridge, and southeast from Nashua.

Attempt to harmonize descriptions of Crosby and Hitchcock.

Structure.

Dip, strike, general section.

Evidences of faults.

Cause of metamorphism.

Maps of Crosby and Hitchcock.—Crosby's map of eastern Massachusetts represents an area of slate, or argillite, as it is termed, running from Worcester through Lancaster and Pepperell, to the New Hampshire state line. The eastern part of this argillite, two and one-fourth miles wide on the map, but four miles wide according to the text,* continues north into New Hampshire just west of the Nashua river. On the east of the argillite lies mica schist in an area very narrow (three-fourths of a mile) near the state line, but much wider toward the southern part of the township of Dunstable. On the west

*Crosby's "Geology of Eastern Massachusetts," p. 137.