

at the rate of 20 to 25 millions of cubic feet of gas per day, and half the whole amount came from a single well, the Karg well. One boring in the vicinity, at Bairdstown, yielded 4,000,000 cubic feet per day when 9 feet down in the limestone, and 12,400,000 when 17 feet down; and the tools "refused to descend deeper, dancing in the well like rubber balls." (Orton, *Rep. Econ. G. Ohio*, 1888.)

The rock pressure in some parts has been found to equal 650 pounds to the square inch; in the Findlay field it is about 450 pounds; in the Indiana field about 320 pounds. Owing to the pressure, the gas, as it is confined in the Trenton limestone, is greatly condensed, — its volume, if the pressure equals 320 pounds to the square inch, being about $\frac{1}{15}$ th of that after escape.

The productive limestone, as stated by Orton, is in all cases dolomite. In the Findlay region the composition was found to vary from a ratio, for the calcium and magnesium, of 1:1 to that of 2:1. The marsh conditions under which dolomite is formed are favorable for the gentle trituration or maceration of organic materials, and their inclusion in the deposits so made. It is found, also, by Professor Orton, that the limestone is porous, and is thus enabled to contain the oil or gas. Since the conversion of calcyte to dolomite causes a diminution in bulk of $\frac{1}{10}$ to $\frac{1}{8}$ (page 134), the pores, which are a result of the change, should give the rock great containing capacity — equal, says Orton, to the actual amount afforded.

The amount of marsh gas (ordinary illuminating gas) in the mineral gas of Findlay is about 92.5 per cent; and with this are 2 per cent of hydrogen, 0.3 of olefiant gas, 3.5 of nitrogen, and about 0.5 per cent each, of oxygen, carbonic acid, and carbonic oxide, and 0.2 of hydrogen sulphide. In the region of Lima, Ohio, the limestone yields oil. Salt water, also, comes up in some borings. In the borings water is excluded by tubing. The production of the wells is often greatly increased by lowering torpedoes containing from 20 to 160 quarts of nitro-glycerine to the bottom of the well and exploding them by means of a piece of iron called a "go-devil," which is dropped down the hole and strikes a fulminating cap on the torpedo. The whole process is termed "shooting" a well. The explosion shatters the rock and opens fissures. Thus the area of supply is extended and the yield of oil or gas increased.

In Indiana the natural gas territory adjoins the eastern, or Ohio, boundary for about 65 miles, and has an average width of 50 miles. The porous layer, according to A. J. Phinney, is 1 to 20 feet thick, and lies beneath a non-porous outer layer of the limestone, 1 to 15 feet thick; and the rock is sometimes so open-textured that air may be freely blown through it, and it will absorb $\frac{1}{10}$ or even $\frac{1}{8}$ of its weight of water. In 1890, the aggregate daily flow of the Indiana gas wells was 779,525,000 cubic feet. (Phinney, *U. S. G. S. Rep.*) The Trenton limestone has afforded no gas or oil in Kentucky or Pennsylvania.

Marbles. — The Chazy affords black marble in the vicinity of Lake Champlain. The Taconic crystalline limestone yields white and clouded statuary