

descend to a coarse oil-yielding porous sandstone called an *oil-sand*; and on reaching it, the oil, if the well is successful, usually rises to, or above, the surface; or if a gas well, the gas comes out with great force. The number of different oil-sands in a region is one to three; they are confined to about 300 feet in thickness of the beds, and each is 20 to 60 feet, or more, thick. The productive counties lie in a belt, nearly northeastward in course, from Greene County, in the southwest part of the state, to McKean County, on the northern border; and they pass this border into Alleghany County, N. Y., and also on the south, into Monongalia County, W. Va. See map, page 731. In the counties from Warren to Washington the oil-sands are within 400 feet of the summit of the Devonian; in the part of the belt more to the northeast, in McKean County, and in New York, they are in its lower part, or between 1200 and 1800 feet of the summit. The latter is a high region, the surface 1800 to 2600 feet above the sea level. The wells often let up much salt water from different levels. Frequently water rises with the oil or gas, making the well valueless unless tubing to the bottom will exclude the water.

The *oil-sands* are coarse, open-textured sandstones—so open in texture that they are able to hold a vast amount of oil in the spaces between the grains. All the oil-bearing regions are also gas-producing; but the well is available for gas only when the latter comes to the surface free from oil as well as water. Moreover, the gas is abundant, according to I. C. White, only where the rocks passed through in the drilling lie in a low anticline. The open-textured sandstones are possibly sandstones that have lost the finer material between the grains by percolating waters. As some of the Chemung beds are more or less calcareous, they may originally have been *calcareous* sand-beds, and have become porous by the removal of the calcareous part; but this is only conjecture.

The oil is usually projected in jets, and the power has been shown to be Artesian, or hydrostatic, by I. C. White, in agreement with Orton's view for the Trenton limestone gas of Ohio and Indiana. A well near Kane, in McKean County, Pa., drilled to a depth of 2000 feet, in 1878, but abandoned because of the small yield of oil, became afterward a water-and-gas geyser, gas and not steam being the moving agent. Fig. 925 is from a photograph received in 1879 by the author from C. A. Ashburner, accompanying a description by him of the geyser. The well at that time threw up a column of water and gas, at intervals of 10 to 15 minutes, to heights varying from 100 to 150 feet. On August 2d four successive jets had heights of 108, 132, 120, and 138 feet. When the gas of the columns was lighted at night, "the antagonistic elements of fire and water were promiscuously blended, at one moment the flame being almost extinguished, but only to burst forth the next instant with increased energy and greater brilliancy." Mr. Ashburner explains the action thus: "The water flows into the well on top of the gas until the pressure of the confined gas becomes greater than the weight of the superincumbent water, when an explosion takes place, and a column of water and gas is thrown to a great height." The gas comes