LENSING SANDS OF OHIO[1]

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Oil production began in southeastern Ohio during the year 1861. Since that time central and southeastern Ohio have produced about 215 million barrels of oil.

Most students of central and eastern Ohio regard all producing sands there as lenticular, for, although the Cow Run, Big Injun, and Berea are similar in outcrop to the subsurface producing formations, their variations in thickness and their rapidly changing physical properties suggest lenticularity.

The Clinton sands grade to a shale west of the big Clinton gas field, and in the western half of the state are also represented by shales.

The Clinton sand is usually light colored and clean, but in places it is brick red. The range in thickness is generally from 10 to 40 ft. (3 to 12 m.), but the maximum occasionally reaches 100 ft. Along its western edge the sand is thinner and somewhat patchy.[3]

Six formations above the Clinton have been important sources of oil and gas. Sixty-five per cent of the shallow-sand production in Ohio, including the Berea, has some structural basis.

The analysis of well cuttings was not a common practice during most of the time when the oil and gas formations of Ohio were being drilled. Thus we have had to depend for lithologic information on drillers' logs, which are usually not reliable.

There is a tremendous thickness of Ohio shales in eastern Ohio in which it might be possible to encounter lensing sands. However, holes in various parts of north, east, and southeast Ohio have been drilled into the Clinton without finding sands in this great shale thickness. A producing sand was discovered in these shales during 1932 in Grandview Township, Washington County. The discovery well, with a total depth of 3,040 feet, made about 40 barrels of oil per day. During 1938 it produced an average of $2\frac{1}{4}$ barrels of oil per day. Offsets to the well were not commercial producers.

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[3] J. A. Bownocker, "Rise and Decline in Production of Petroleum in Ohio and Indiana," *Trans. Amer. Inst. Min. Met. Eng.*, Vol. 65 (1921), p. 108.

Clinton.—Important pools are the Bremen, Black Run, New Straitsville, New Lexington, Union Furnace, and Pike Coshocton. The Clinton sand is very tight and has a porosity ranging from 13 to 15 per cent. As there has been no water encountered, the oil production is entirely due to gas expansion, and it is thought that a great percentage of the oil is left in the sand after the wells are abandoned. No important structural features are responsible for accumulation of oil or gas in the Clinton sand.

Newburg.—This formation became prominent in 1913 with the opening of a small field at Newburg, southeast of Cleveland. This so-called sand is generally impure, porous dolomite, varying from light gray to pink in color. Locally the horizon contains thin lenses of sandstone, evidently deposits left along the line of disconformity. The position of the Newburg is commonly 150–250 feet above the base of the "Big lime."

The thickness of the Newburg sandstone ranges from 1 to 30 feet, but is commonly between 8 and 15 feet. So far it has been a good producer of gas, but has yielded only minor quantities of oil.

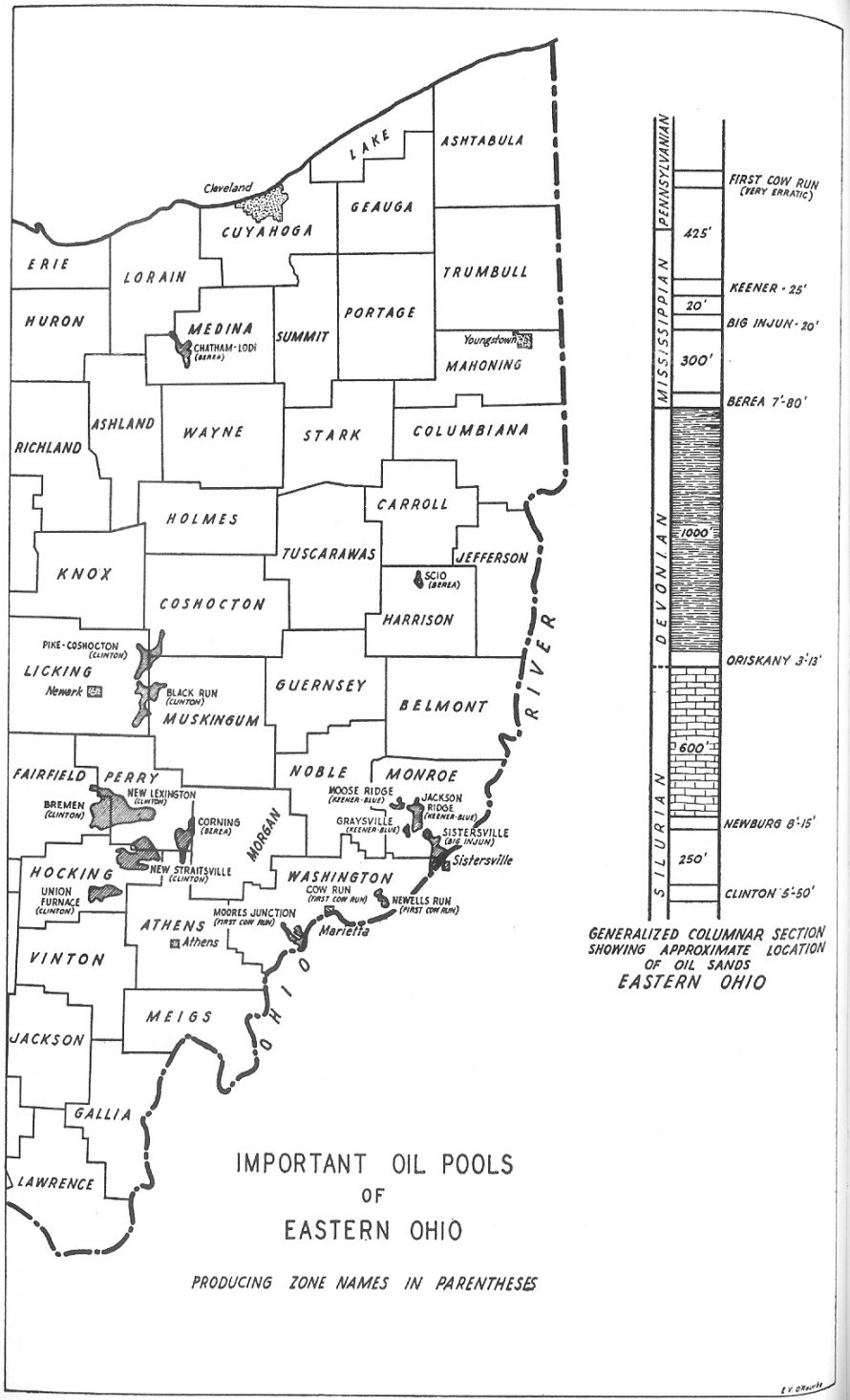
The largest pools are found in Cuyahoga and Summit counties. Since this formation is one of the chief water-bearing horizons in the deep-seated rocks, the occurrence of gas in the Newburg sandstone is confined to structural deformations.

Oriskany.—This formation has been the important producer in Guernsey County. It had high pressure and large initial open flows, but was short-lived. The oil and gas in the Oriskany are found in areas with structural relief.

Berea.—There is oil produced from the Berea, in Lorain, Medina, Trumbull, Columbiana, Stark, Jefferson, Harrison, Belmont, Guernsey, Monroe, Noble, Vinton, Perry, Athens, Morgan, and Washington counties. This formation is uniform in texture and in most places uniform in thickness within a pool, with the exception of the Chatham-Lodi pool. Important pools are the Chatham-Lodi, Scio, and Corning. Porosity is figured at 10–17 per cent. Scio is a broad terrace in structure. Water-drive is active in the late producing stage of Berea fields. We believe that this formation ranks next to Trenton as to accumulative oil produced in Ohio.

Big Injun.—This formation has been most important in the Sistersville area which comprised 10,000 acres in Ohio. The oil is trapped on the east flank of an anticline. There has been an active water-drive.

Keener (Blue).—This has been important at Graysville, Jackson Ridge, and Moose Ridge. The formation is uniform in distribution and thickness. The production was very long-lived. Little or no water has been found in this formation.



Keener (White).—The White Keener sand is responsible for some local small pools which are very spotted.

First Cow Run.—This is important in Washington and Morgan counties. The Cow Run, Newells Run, and Moore's Junction are the important pools. About one-third of the tests are dry holes, due to the erratic thickness and distribution of the sand.

Discussion.—The formations may be listed in order of present producing importance, as follows: Clinton, Berea, Keener, First Cow Run, and Big Injun.

It is probable that the Berea will take first place soon, due to extensive water-flood operations in the formation in Medina County.

This article has been written from material found in the following bibliography and as a result of intensive studies on all past oil and gas production in Ohio.

BIBLIOGRAPHY

BOWNOCKER, J. A., "Oil and Gas," *Ohio Geol. Survey*, 4th Ser., Bull. 1 (1903).
———, "Bremen Oil Field," *ibid.*, Bull. 12 (1910).
———, "Rise and Decline in Production of Petroleum in Ohio and Indiana," *Trans. Amer. Inst. Min. Met. Eng.*, Vol. 65 (1921).
COTTINGHAM, KENNETH, "Structural Conditions in Portions of Eastern Ohio," *Structure of Typical American Oil Fields*, Vol. 1 (Amer. Assoc. Petrol. Geol., 1929), pp. 124–37.
LOCKETT, J. R., "General Structure of the Producing Sands in Eastern Ohio," *ibid.*, pp. 138–47.
ROTH, E. E., "Natural Gas Reserves; Appalachian Natural Gas Province District," *Amer. Petrol. Inst. Paper 826-9D*, given at Eastern District Division of Production, April 14–15, 1938, Pittsburgh, Pennsylvania.
STOUT, W., and others, "Natural Gas in Central and Eastern Ohio," *Geology of Natural Gas* (Amer. Assoc. Petrol. Geol., 1935), pp. 897–914.