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GAS IN LEIDY TOWNSHIP, CLINTON COUNTY, PENNA.

By

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Introduction. In the past twelve months, the Clinton Natural Gas & Oil Company of Renovo, Pa., has demonstrated that gas exists in commercial quantities in Leidy township, Clinton County. To determine something of the structure and stratigraphy and to get light on future developments, the author visited this newly developed field in the latter part of April, 1923.

Leidy township in the northwest corner of Clinton County is in a sparsely populated region of high, flat-topped wooded hills and narrow, deep valleys. Kettle Creek is the only stream of any importance in the township and most of the population lives along the banks of this stream. No railroads traverse the township and all supplies have to be brought in by wagon or motor-truck from Westport, the nearest station on the Pennsylvania Railroad. The main road (along the valley of Kettle Creek) in dry weather is hard and easily traveled, but in winter or after heavy rains transportation is a problem.

The massive Pottsville conglomerate caps most of the hills/as the dip of the strata is low, the hilltops are flat and at about the same elevation.

No topographic map has as yet been made of this district, the only maps available being inaccurate or on too small a scale to permit making exact locations. It is to be hoped that funds will be available soon for the continuation on a larger scale of the topographic mapping of this State. The map contained in this report is based upon one prepared by the State Department of Forestry for its own use.

Stratigraphy. A fairly complete section extending from the top of the Pottsville formation to the middle of the Pocono, is exposed on the steep hill slope back (northeast) of Renovo. At this point the following section was measured:

Pottsville conglomerate - - - - -	200 ft.
Mauch Chunk red shales (and concealed) - -	77 ft.
Pocono sandstone and shale - - - - -	550 ft.

The Pottsville conglomerate as exposed here is very hard and massive and consists of gray to white grains and small pebbles of quartz. In the sunlight the quartz grains sparkle in such a manner as to readily distinguish it even at a distance from all other formations outcropping in this region.

The Mauch Chunk formation is indicated only by a red, clay soil, the rock not being exposed. It was impossible to determine how much of the 77 foot measured interval actually consists of red shale.

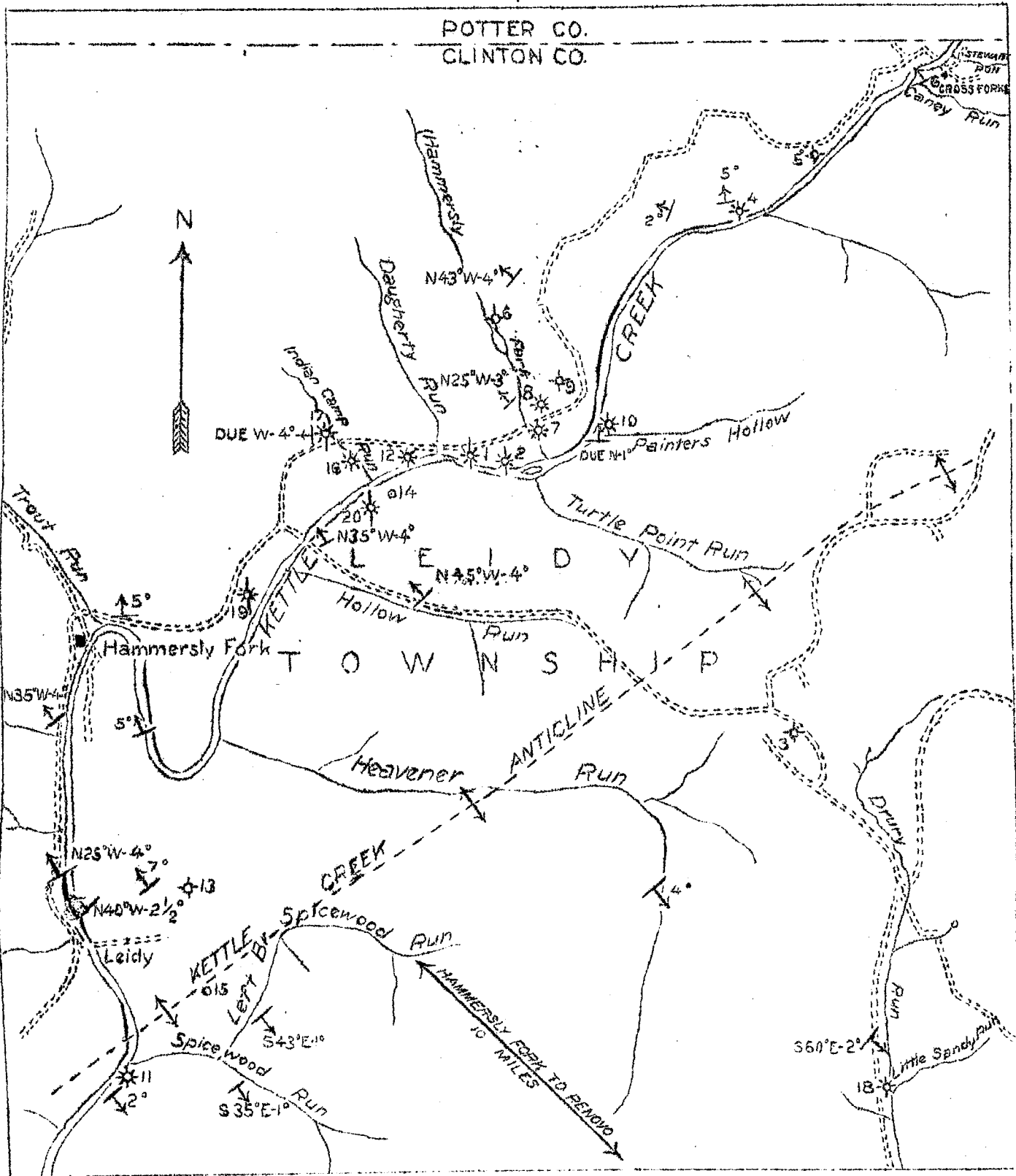
The Pocono formation consists chiefly of a fine to medium grained, yellowish sandstone often having a faint greenish tint. Some shale is interbedded with the sandstone, and in the lower part of the section two thin, red shale bands are exposed. These bands are lenticular and occur between beds of yellowish, cross-bedded sandstone.

All the gas wells on Kettle Creek start near the base of the Pocono formation, pass through the Catskill, and bottom in the Chemung. The gas comes from a horizon corresponding to that of the Clarendon sand of Warren County.

Structure. Renovo is near the center of a broad syncline, called the Karthaus-Renovo* syncline. The axis of this syncline almost parallels the course of the West Branch of Susquehanna River and in general has a N. 60° E. trend. In traveling up Kettle Creek one notices a steady southeast dip of two or three degrees until Spicewood Run is reached. A few hundred feet farther, at McCoy's Run, there is a pronounced dip to the northwest. Evidently the axis of an anticline, which we will call the Kettle Creek anticline, passes between these two runs - probably quite near to Spicewood Run. The trend of the Kettle Creek anticline as plotted from dips observed in the field, is shown in figure 1. This map also shows the location of all wells drilled in the Kettle Creek field to date.

* Second Pennsylvania Geol. Survey, Vol. G4, p. 30, 1880

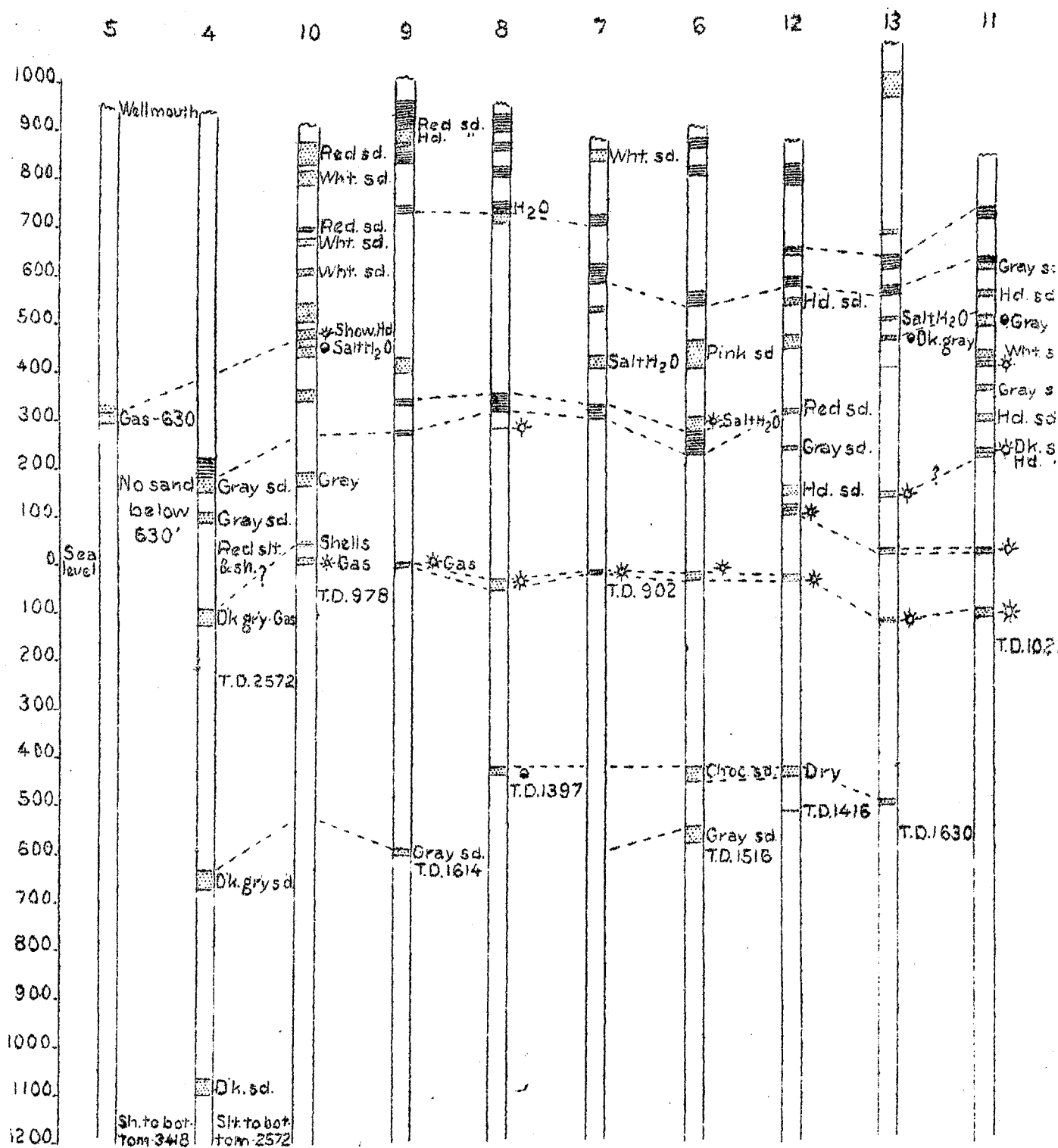
Fig. I. Kettle Creek Gas Field, Leidy Township, Clinton County.



LEGEND

- o Location
- o Drilling well
- * Gas well
- * Dry hole, showing of gas.
- o Dry hole
- * Abandoned gas well
- ↘ Showing direction of dip.

FIG. 2. KETTLE CREEK WELL SECTIONS



LEGEND

Sandstone
 Red sh.
 T.D.=Total depth
 * = Gas
 * = Show. of Gas
 Choc.=Chocolate
 H₂O=Water
 ● = Show. of oil

From figure 1 it will be seen that only two wells, No. 11 and No. 13, have been drilled close to the axis of the anticline. No. 11 is the best well so far obtained, with a rock pressure in April, 1923 of close to 700 pounds per square inch. The No. 13 well found no sand at the producing horizon and hence proved a "duster." All the remaining wells, with the exception of No. 3, have been drilled on the northwest flank of the anticline. Since the pitch of the anticline is to the southwest it is evident that northeast of No. 11 well, gas should be obtained farther down the flanks of the anticline. For this reason it is hard to see why, from the standpoint of structure, the No. 3 well was not successful. Probably the explanation lies in a "tightening" or "pinching out" of the producing sand in that direction.

Figure 2 shows the well sections and the correlations made. It will be noticed that there is some variation in the intervals between the various red beds and sands, etc., but this is no more than would be expected. A study of the rocks exposed at the surface shows a similar variation. It is greatly regretted that the detailed records of some of the wells drilled earlier are not available. The No. 5 well for instance was drilled to a depth of 3418 feet and a good record of that well would show the character of much of the Chemung formation.

Just where the Pocono ends and the Catskill begins is a problem which the author will not attempt to solve, it being of little importance to the present work. Of more importance is the fact that the producing sand occurs some 275 feet beneath the lowest red bed of the Catskill formation. This position corresponds closely to the Clarendon or Queen sand of Warren County. However, it is neither claimed nor believed that it is the actual eastward extension of that sand. In all probability that sand pinches out before reaching the eastward boundary of Warren County. Similarly, the chocolate colored sand lying four hundred feet beneath the producing sand, occurs in the approximate position of the Bradford sand, although it is not believed to be the same identical bed. In the remainder of this report the producing sand will be referred to as the Kettle Creek sand.

Figure 2 shows also that No. 13 well is the farthest down structure and No. 10 well the farthest up structure. Well No. 6 is down the dip of the structure from wells No. 7 and No. 8, but due to a shortening of the interval between the red beds and the Kettle Creek sand, the latter is only slightly lower at this point than at well No. 7. Structurally both the No. 6 well and the No. 9 well should be productive. The fact that they came in dry is probably due to a "tightening" of the Kettle Creek sand at those points.

Previous drilling and present development. At the time of writing (April 25, 1923) eighteen wells have been drilled in the Kettle Creek field. The first well (No. 20) was drilled in 1864 on the Wm. Sanson property and obtained gas sufficient for domestic purposes. No record remains of the strata penetrated by the drill or of the actual quantity of gas obtained. In 1878 a second well (No. 16) was drilled

to a depth of nearly 1800 feet and obtained gas sufficient to fire one boiler. Gas still escapes from this well although it was at least partially plugged and is at the present time nearly filled by pebbles and cavings. Several years later another well was drilled only 100 feet away, but no more gas was obtained than at the first.

Some thirty years ago a fourth well (No. 18) was drilled at the junction of Little Sand Run and Drury Run. Little is known of this well now although it is reported to have had a show of gas. A fifth well (No. 19) was drilled in 1911-1912 on the Summerson farm. A good show of gas was obtained but the well was abandoned.

The Clinton Natural Gas & Oil Company and its predecessor the Williamsport Oil and Gas Co. have drilled thirteen wells to date, with a fourteenth well now drilling. These wells are numbered in the order of their drilling. The location for a fifteenth well is also shown.

The first two wells drilled by the aforementioned company were both good producers (combined production of over 600,000 cubic feet of gas per day) but at the present time are flooded and now constitute a grave menace to the rest of the field. Unless they are cleaned out and properly cased, or else plugged, they will in time flood the entire field. It is to be hoped that action will be taken in this matter at once.

At the time of writing seven wells are producing gas, five of which (Nos. 7, 8, 10, 11, and 12) are capable of producing a total of 4,000,000 cubic feet a day. The rock pressures range from 125 (No. 7 well) to 700 (No. 11 well) pounds. It is a noticeable fact that the pressure is lowest near the older wells (No. 1 and No. 2) and is progressively higher with any increase in the distance from them.

Future development. The Kettle Creek field has been only partly defined as yet, there being plenty of room for enlarging the proven or producing area. What appears to be the most favorable area (see fig. 1) in the district, namely, the area between Heavener Run, Kettle Creek, Turtle Point Run and the axis of the anticline, has hardly been touched as yet. There is also plenty of room for expansion both north and south along the anticline. It is quite probable that a production of fifteen million cubic feet of gas a day could be developed within a few months by instituting an active drilling campaign. As regards the staying quality of the field or its ability to keep up production and pressure, the record of wells No. 1 and No. 2 is proof that wells will produce for several years at least. The two wells mentioned produced gas for domestic and drilling purposes for more than ten years before they were drowned out. The sand is too thin, averaging only 10 feet or so in thickness, and lies at too shallow a depth to insure wells lasting that long if drawn upon heavily.

Possibility of other productive horizons. Enough wells have already been drilled to a depth of 500 feet or more below the present productive horizon to prove fairly well the absence of other "pay" sands within ordinary drilling depths. This includes all the known

producing horizons above the Oriskany. The latter sand if present in this district would be at an almost prohibitive depth (about 5,000 feet). Since the Oriskany is lacking at Lock Haven, it is quite likely that it is also lacking here.

Utilization. As yet no commercial quantities of gas have been produced and sold (i.e. gas has been used only for drilling and domestic purposes). The chief reason for this is the distance of the field from an available market. The nearest town of any importance is Renovo, and that is 10 miles distant in an air line. A pipe-line of that length would mean a large investment. Reasonable proof of the ability of the field to produce gas in sufficient quantities to repay the investors must first be forthcoming before embarking on such a program.