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OIL POSSIBILITIES IN THE DRY PINEY AND BIG PINEY DISTRICTS,
LINCOLN COUNTY, WYOMING.

The purpose of this article is to give the public a general idea of the geological conditions and development in the above fields and to draw attention to certain peculiarities of structure and new possibilities for oil in the Montana and upper Colorado formations.

The writer made a personal examination of this area in July, 1920, and in addition he is indebted to the U.S. Geological Survey for data contained in this review. These Survey bulletins are No. 543, by A.R. Schultz (Geology and Geography of Lincoln County, published in 1914), and Press Bulletin No. 437, issued in January, 1920.

Although oil has been discovered so far only in Sections 1 and 12, T. 28 N., R. 114 W., prospect wells are being drilled 6 miles north, 8 miles south, and ten miles southeast of the proved area. The results obtained in these wells will determine whether or not there is just one structure, or a system of north and south parallel folds or anticlines containing oil in the Cretaceous formations, which structures are practically concealed by the overlying Tertiary beds.

The Dry Piney field proper is located about 60 miles north of Kemmerer and about the same distance from Opal, Wyoming, both on the Union Pacific Railway. The structure covers about

1000 acres in Sections 6 and 7, T. 28 N., R. 113 W., and Sections 1 and 12, T. 28 N., R. 114 W. The topography is characterized by a high north and south ridge, called the LaBarge Ridge, on or near the crest of which the oil wells are located. The field is also located on the so-called LaBarge anticline, which is closely associated with the ridge of the same name. This structure was mapped by the U.S. Geological Survey in 1907 and in theory is supposed to extend in a nearly north and south direction from the LaBarge oil field in Section 3, T. 26 N., R. 113 W., and through the Dry Piney field and as far north as Section 30, T. 29 N., R. 113 W.

Structurally, the LaBarge anticline presents some rather unusual features in the Dry Piney field. The coal-bearing Adaville formation of Montana Age is exposed on the surface in a narrow strip through Section 12, T. 28 N., R. 114 W., and Sections 7 and 18, T. 28 N., R. 113 W. These rocks are sharply flexed, dipping at an angle of about 25 or 30 degrees on each side of the axis of the anticline, which axis bears about N., 30 degrees W. Immediately to the east of the axis the Knight formation of Eocene (Tertiary) Age is found resting unconformably on the Adaville, but dipping also to the east at an angle of about 5 degrees. On the top of the ridge in places and on the western flank the overlying rocks are pre-Carboniferous and consist of limestone, quartzite, and conglomerate. They were pushed up in that position by the same forces that caused the folding and the result is a tremendous overthrust fault of probably 20,000 feet displacement. Much older rocks are thus over-riding the Cretaceous formations, and on either side of the ridge the younger Tertiary formations are resting unconformably on the Cretaceous to the east and the Cambrian to the west. The

Tertiary beds are slightly arched, coincidentally with the older formations. This arching in the Tertiary beds over the pronounced anticlines in the Cretaceous and older rocks, especially in this field where oil has been found, has given rise to the theory that slight folding in the surface beds of the Tertiary indicates underlying structures in the Cretaceous and possible oil reservoirs. A number of operating companies are working on this theory and have located several such structures in which they are drilling test holes.

The Big Piney Oil Company is testing out the theoretical northern extension of the LaBarge anticline in the NE¹/₄ of Section 9, T. 29 N., R. 113 W. The well is down about 800 feet. The Green River petroleum Company, on the other hand, is drilling on the southern extension in the NW¹/₄ of Section 16, T. 27 N., R. 113 W. This well is something over 1000 feet deep. The Wyoming-LaBarge and Dry Piney Oil Company is putting down a test in Section 28, T. 28 N., R. 112 W., and the Associated Oil Company of California has a number of leases near Big Piney, where a test well will soon be drilled. In all of these locations the surface rocks are Tertiary. There are also tests being made by other companies under similar conditions. If any of these bring in oil, it will open up large possibilities in prospecting Tertiary covered area. In the minds of most geologists familiar with this country there is very little doubt that a zone of intense folding exists in the Cretaceous and older rocks associated with the LaBarge anticline east of the Darby fault. The main problem is to pierce the Tertiary blanket in the most likely place to find the crest of a fold, which crest may be indicated by the slightly dipping beds on the surface. Such things as the thickness of the Tertiary overburden and the horizon of the contact in the Cretaceous can be determined only by drilling.

The oil in the Dry Piney field is found at a depth of about 1000 feet in a sand of the Hilliard formation, which probably corresponds to the Pierre or Steele shale of central and eastern Wyoming. The sand is reported to be 43 feet thick in one well and much thicker in another, and is believed by some to be a lens rather than a sheet sandstone. The belief held by some geologists is that the Hilliard contains a number of such lenses which are more than likely oil-bearing and, if so, the oil-bearing possibilities will not be so much governed by structural conditions for the reason that lenses are generally sealed off by enclosing shale beds. Above the sand there is a sandy shale which give up a small amount of shale oil and which contains a thin water sand. The Hilliard, as measured by Schultz, is about 3000 feet thick and is underlain by the coal-bearing frontier formation. The Frontier in central Wyoming is the principal oil-bearing formation and is not coal-bearing. It is not improbable that the Hilliard will be found to contain the producing oil sands in this district.

Two wells that are capable of producing oil at the present time are No. 1 and No. 2 of the Lincoln-Idaho Oil & Development Company, located in the NE¹/₄ of Section 12, T. 28 N., R. 114 W. No. 1 wells is 1023 feet deep and the drill passed through 43 feet of oil sand in the bottom of the hole. This well is not producing, but is reported to be capable of 50 barrels per day. No. 2 well is making oil, gas, and water. The oil is sold in the field for drilling purposes and the gas is used in camp for drilling and domestic use. The oil yield is reported to be about 25 barrels per day. It is full of water and gas is bubbling up. Preparations are being made to clean out this well, shut off the water and drill it deeper. It is 1070 feet deep, mostly in shale, and is reported

to have stopped on the top of the sand. Shale oil was encountered from 840 feet down. Well No. 1 of the Cretaceous Oil Company is a few hundred feet north of the Baum well. It is reported to be 835 feet deep and not in the sand and it also is supposed to contain some shale oil. The same is probably true of the Lackey well in the NW¹/₄ of Section 1, which is reported to be 846 feet deep.

More systematic and deeper drilling in this field should produce some very good results. More care should be taken to shut off the water before entering the sand in drilling these shallow wells. Also, if proper precautions are not soon taken to shut off the water from the sand in the producing wells, the production from the first sand will be greatly impaired in this field. For their own protection the operators should form some sort of an association to enforce the rule that proper drilling methods be used in this district. It is to be regretted that the existing State laws do not cover this situation.

New wells are being drilled in this immediate locality as follows:

Lincoln-Idaho No. 3, Section 7, T. 28 N., R. 113 W.
This well is down about 700 feet.

A well in the SE¹/₄ Section 1, T. 28 N., R. 114 W., by the Piney-Crescent Oil Company.

A well in the SW¹/₄ Section 6, T. 28 N., R. 113 W., by the R. and N., Oil and Gas Company.

Several other companies are also making preparations to enter this field.

The Dry Piney oil is very high grade and contains a large percentage of gasoline and other light hydrocarbons. The following analysis is taken from U.S. Geological Survey Press Bulletin No. 437:

"Results of fractional distillation of oil from
Dry Piney oil field, Wyoming.

Temperature (°C)	Air distillation with fractionating column (barometer, 749 mm.)			Vacuum distillation, without column (pressure 40 mm.)		
	Fractions (% by vol.)	Total % (by vol.)	Spec. Grav.	Fractions (% by vol.)	Total % (by vol.)	Spec. Grav.
Up to 50	0.1	0.1	0.760			
50 to 75	1.6	1.7				
75 to 100	1.1	2.8				
100 to 125	7.9	10.7	.785			
125 to 150	11.5	22.2				
150 to 175	12.0	34.2				
175 to 200	10.1	44.3	.808	1.6	81.4	0.865
200 to 225	9.0	53.3	.825	4.4	85.8	.865
225 to 250	9.5	62.8	.845	4.3	90.1	.852
250 to 275	9.0	71.8	.852	3.5	93.6	.879
275 to 300	8.0	79.8	.855			
Residue						

Specific gravity of oil at 15°, 0.824 (39.9° Baume, Modulus 140). Sulphur, 0.13 per cent.

This test shows that the oil has an unusually high content of volatile constituents, between 45 and 50 per cent of which was gasoline. Larger percentages of volatile matter were given off at temperatures of 125 to 200° C. than at any other temperature. Practically 80 per cent of the sample was gasoline and kerosene, about 20 per cent of the original quantity remaining undistilled at 300°C

In the vacuum distillation 93.6 per cent was volatile matter and only 6.4 per cent was probably lubricating or fuel oil. Sand-filtered oils usually show high percentages of volatile constituents, the heavier hydrocarbons being filtered out, and this appears to be and oil of that type."

The future of the Dry Piney field probably depends largely upon the existence of lower and more prolific sands in the Hilliard formation, which should be fully tested out in a 3000 or 3500-foot well. This, together with the extent of the field, can be determined only by drilling. The same is also true of the other prospects in the Dry Piney and Big Piney districts, inasmuch as the sub-surface geological conditions are practically unknown.