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GEOLOGICAL CONDITIONS IN THE NAVAL RESERVE OIL FIELD, OSAGE COUNTY, OKLAHOMA

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It is the purpose of this paper to present some of the more salient geological features found in the Naval Reserve oil field, located in Township 24 North, Range 7 East, in south-central Osage county, Oklahoma. The name of this field has its origin in the fact that part of the present producing area was set aside a number of years ago as a naval reserve for oil by the Federal Government. After this restriction was removed, leases were made to private oil operators following the usual Osage Indian Agency procedure.

STRATIGRAPHY

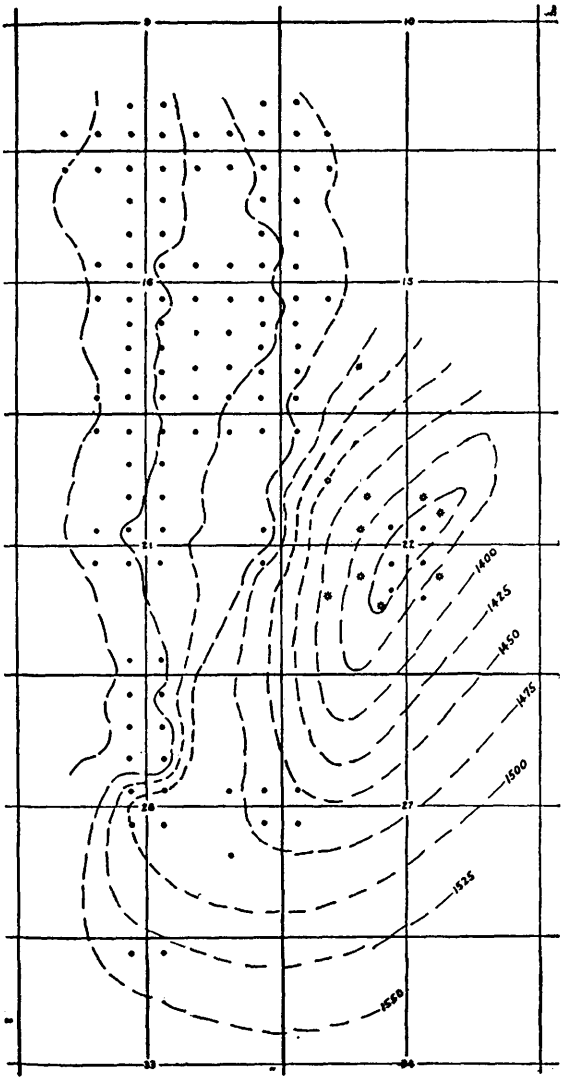
Late Pennsylvanian shale and limestone beds are exposed at the surface of the Naval Reserve district. These alternating shale and limestone and occasional sandstone beds, extending down to a depth of 2,200 to 2,300 feet, have been named and correlated by the U. S. Geological Survey. This part of the stratigraphic column is of but little interest to the petroleum geologist. The following section, occurring below the depth given above, contains the important subsurface markers and oil reservoirs:

	Feet
Big Lime	80
Shale	30
Oswego Lime	90
Shale	110
Pink Lime	10
Shale	12
Bartlesville Sand	90
Shale	80
Burgess Sand	0-25
Mississippi Lime	200
Chattanooga Shale	0-15
Lower Simpson—	
Green Shale	80
Sand	30
Siliceous Lime	100-500

DEVELOPMENT

After individual operators were permitted to take leases in the old Naval Reserve, a number of gas wells and six oil wells were completed in

Section 22. The producing horizons for these earlier wells were the Burgess and Lower Simpson. In 1932, the Continental Oil Company completed the first Bartlesville sand well in the area, located in the SE., NE. of Section 21. During 1933, about a half dozen additional wells were drilled into this zone. By November, 1934, a total of 97 wells had been completed in the Bartlesville as producing oil wells. Up to the present time, no dry holes have been drilled in or adjacent to the producing limits of this field.



The initial production of the Bartlesville sand wells in the field have ranged from 17 to 2,000 barrels a day. It is likely that the ultimate per acre yield will approximate 7,500 barrels By agreement of the operators no drilling is now being done. The daily production is being held to 7,900 barrels, although the potential is slightly in excess of 16,000 barrels.

A few of the wells in this field when completed were able to flow naturally, however, most of them had to be shot with from 20 to 150 quarts. Many of the wells that otherwise would be pumping at the present time are still flowing because the operators have conserved the gas energy by means of tubing flow-strings and bottom packers.

GEOLOGICAL FEATURES

The structural geology of the Naval Reserve Field is indicated on the accompanying subsurface map by 25 foot contours based on the top of the Pink Lime. This picture agrees very closely with the surface structure as mapped by the U. S. Geological Survey. The westward rgional dip is broken by a rather sharp anticline in Section 22

and further interrupted by a narrow terrace in Section 16. Subsurface maps of the field employing a shorter contour interval reveal minor folds and faults.

Oil and gas production from the lower horizons, that is the Burgess and Simpson, is restricted to the crest of the anticline. This is true in most of the Osage county oil fields. The Bartlesville sand production, on the other hand, occurs down low on the western flank of the structural high and is controlled by the position and conditions of the sand body itself. The Bartlesville zone in Osage county is a true sand lense of undetermined north-south length and having a maximum width of about four miles. Pure sand grades rapidly into sandy shale and shale to the east and west.

In this sand body is a limited quantity of gas, oil and water. Gas and oil occurs up-dip and salt water down-dip. The movement of fluid in the sand is by means of gas energy alone. The amount of oil produced from any one well depends entirely upon the porosity of the sand at that particular location. For that reason, very light wells may be offset by heavy producers. Although a rather sharp line seems to exist between pure salt water sand and the oil-saturated sand, it can be said that the exact water level in the field has not been definitely determined. In some of the wells small amounts of water have been found at relatively high elevations. Possibly this condition can be accounted for by the sand being broken by shale streaks containing small sand lenses that have apparently trapped off isolated water bodies in the otherwise oil-saturated sand.

The geologic conditions discussed above and that appear to be true generally in the Bartlesville sand area greatly hinders the petroleum geologist from accurately determining the presence of the sand body from the surface geology alone. Then, even after the discovery is made, it is rather difficult to predict the extent of the field and the relative values of adjoining leases until after all of the wells have been drilled.

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