

Mule Creek

PRELIMINARY REPORT ISSUED ON EASTERN WYOMING STRUCTURE NOW IN PRODUCING CLASS.

Geological surveys affecting the Mule Creek Field in the Northwestern part of Niobrara County, four miles east of the State line and eighteen miles Northwest of Edgemont, S.D., are made public in a recent bulletin issued by the United States Geological Survey, preliminary to a complete report on the structure which has been added to the producing fields of the State. The statements on this field, by E.T.Hancock, government geologist, follows:

STRUCTURE OF THE BEDS IN THE FIELD.

The Rocky Mountain Front Range and the Black Hills uplift are connected by what is commonly known as the Hartville uplift, an anticlinal fold whose axis is indicated by exposures of granite, schist, and limestone near Hartville and Lusk, and at Rawhide Butte, and also by the Old Woman anticline, which brings to the surface the uppermost beds of the Sundance formation. The direct continuation of this axis in the Mule Creek Oil Field is about midway between the Old Woman anticline and the rather steeply dipping beds along the southwest flank of the Black Hills.

The beds in the Mule Creek Oil Field include two well defined anticlines that extend, in general, from north to south and that was separated by a sharply curving syncline. The axis of the western anticline extends from a point near the center of Sec. 23, Twp. 39N., Range 61W., to the northeast corner of Sec. 2 of the same township, and from that point in a sweeping curve to the northeast corner Sec. 30, Twp. 40N., Range 60W., and probably for some distance farther east. The dips of the beds generally range from 5 degrees to 15 degrees, but on the west side of the anticline opposite a small area of Mowry shale, they dip as steeply as 26 degrees. The axis of the eastern anticline extends from the synclinal axis near the northwest corner of the SE $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 12, Twp. 39N., Range 61W., to the Ohio and Midwest wells drilled at the top of the ridge near the west line of Sec. 19, Twp. 29N., Range 60W., and from there follows the township line closely for an indefinite distance southward. The axis of the syncline extends from the northeast corner of Sec. 23, Twp. 39N., Range 61W., to the northwest corner of the SE $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Sec. 12 of the same township, where it makes a sharp curve and extends toward the middle of the north side of Sec. 20, Twp. 39, Range 60W. Well borings near Newcastle and measurements made near Upton and on the east side of the Old Woman anticline indicate that the beds at the top of the western anticline are about 825 feet higher than the corresponding beds beneath the highest point on the eastern anticline, where the Ohio Oil Co.'s producing well was drilled.

FORMATIONS EXPOSED AT THE SURFACE.

The oldest beds exposed in this field are those of the Mowry Shale, which are well exhibited at the highest part of the western anticline in sections 1 and 2, Twp. 39N., Range 61W., and in sections 35 and 36 of the township immediately North. These shales can be readily recognized by their hardness, sandy texture,

light bluish-gray color, and content of fossil fish scales. Here, as at many other places, the top of the Mowry Shale is marked by the presence of beds of bentonite, beneath a zone of dark shale containing numerous heavy, iron-stained concretions. The Mowry Shale is overlain by a thick mass of dark shale, and this is overlain in turn by about 60 feet of Greenhorn limestone, which forms an almost continuous ridge around the western anticline and gives rise to a high escarpment about a mile North of Cheyenne River. The limestone can be readily distinguished from the other formations by its ridge-forming habits, light gray color, and thin beds, and by numerous impressions of *Inoceramus Labiatus*, a fossil of infrequent occurrences in other formations of the Benton group. The Carlile shale, which overlies the Greenhorn limestone, includes about 35 feet of sandstone and sandy and argillaceous shale beds, which lie about 200 feet above the top of the Greenhorn limestone. This series of beds is well exposed around the western anticline a few hundred feet outside of the Greenhorn limestone ridges and along the gulches both east and west of the Eastern anticlinal axis. They occur at the surface at the Ohio Oil Co.'s producing well near the east line of Sec. 24, Twp. 39, Range 61W., which shows they are about 1400 feet above the oil sand, and they are so well exposed along the gulches throughout the eastern part of the Field that the problem of determining the depths to the oil sand in the producing well consists merely of determining the relation of the group of beds to the surface at the point of drilling and of making a slight allowance for the dip. The shale of the Carlile Formation becomes lighter in color towards the top and finally grades upward into the more or less typical Niobrara chalk which can be readily recognized around the south end of the Field by its light yellow to cream color and by its inclusion of thin beds of hard limestone consisting of an aggregation of shells of *Ostrea Congesta*.

DEVELOPMENT.

Considerable drilling has been done, especially on the western anticline, by others than those who are now attempting to develop the Field, but most of the holes are shallow and apparently the records were not carefully preserved. The Ohio Oil Co. is now pumping considerable oil of low gravity from a well near the top of the eastern anticline. This well furnished fuel for most of the drilling. As the quantity of the oil produced increases, it can be piped to the main line of the Chicago & Burlington & Quincy Rail Road, which is about 12 miles east of the Field.

The oil comes from a sand at a depth of 1394 feet, and the Ohio Oil Co. and several other Companies are now drilling with a view of testing that and other sands. The identity of the productive sand in the Ohio Co.'s producing well will probably remain somewhat in doubt until further drilling is done. At Newcastle, Wyo., there is a sandstone lentil in the lower part of the Graneros formation about 250 feet above the Dakota sandstone. Oil seeps from this sand continuously, and 15 to 20 barrels of oil are now stored in a rudely constructed reservoir about 200

set south of the main line of the Burlington Rail Road. If this sand is sufficiently thick in Mule Creek Field, it may contain some oil but it seems to become much thinner along the southwest flank of the Black Hills southeastward from Newcastle, and at Edgemont, S.D., it can scarcely be recognized. South of the Mule Creek Field on the east flank of the Old Woman anticline it included four beds of sandstone from 2½ to 7 feet thick, separated by sandy carbonaceous shale. The log of the Ohio Co.'s producing well shows that the lower 259 feet includes 214 feet of sandstone and very sandy shale and that water occurs in the upper part of the sandy zone. The nature and substance of sandy material and the depth at which the oil was reached do not indicate that the oil is coming from the sandstone in the lower part of the Graneros formation, but rather from a deeper bed, possibly from the Lakota sandstone or some bed near it.

The Midwest and the Sterling Oil Companies are reported to have recently reached the producing sand. The Midwest well is an offset to the Ohio Co.'s producing well and is near the west line of Section 19, Twp. 39N., Range 60W. The Sterling well is near the south end of the western anticline, in sec. 14, Twp. 39N., Range 61W. According to the Oil and Gas Journal of August 8, 1919 these wells will do better than 200 barrels each, but the Geological Survey has no other information regarding the production of either of the wells.

There is evidence in the Mule Creek Field of an unconformity in this part of the sedimentary column. It should be emphasized that the beds which crop out at the Sterling well are probably from 350 to 400 feet stratigraphically below the sandstone that crops out at the Ohio's producing well near the top of the eastern anticline. The sand in the bottom of the Ohio Co.'s producing well should be reached in the Sterling Co.'s well at a depth of approximately 1,000 feet, so that the reported depth of the sand is either an error or that sand is about 560 feet lower stratigraphically than the producing sand in the Ohio well. Considerable oil is reported to have been encountered in the Minnelusa sandstone of carboniferous age in the Old Woman anticline about 15 miles southwest of the Mule Creek Field. Well borings and measurements made at different places along the southwest flank of the Black Hills indicate that the top of the Minnelusa sandstone should be reached at the highest part of the western anticline at a depth of about 1750 feet.