

SOUTH DAKOTA
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Freeman Ward, State Geologist

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INTRODUCTORY NOTE

Beginning with this first issue of the CIRCULAR the Survey puts into effect a policy newly adopted. Heretofore the series of BULLETINS has been used as a medium for presenting to the public the results of investigations carried on under the auspices of the Survey. But it is believed that this series should be supplemented by a series of CIRCULARS in order to better serve the public.

Some subjects have been investigated a longer time, full data have been gathered, such preparatory or experimental work as was necessary has been entirely or nearly finished. In other words the study of the subject is actually completed or so nearly so that the results can be relied on and published with a degree of confidence as to their value. In such a case the matter is to be published as a BULLETIN.

But often during the progress of the work enough information is at hand to be of value to those interested but not enough for a complete treatise. A part of a county may be finished, perhaps, and publication waiting for the complete investigation of the whole county. There may be a demand for statistical matter, or list of references, or current information, etc., which would hardly do for a formal Bulletin. Such partial reports, summary reports, reports of progress, or lists, etc., are to be handled in CIRCULARS. It is planned to publish the Circulars frequently and the Bulletins at longer intervals. With this arrangement much information will reach the public with a minimum of delay.

OIL IN SOUTH DAKOTA

The oil situation in the state is particularly interesting because of the great interest displayed in the subject, the number of rumors afloat and the small amount of positive information so far secured.

South Dakota is not an oil producer. In fact it has not been proven yet whether oil exists in the state in commercial quantities or not. All investigation is at present centered on determining that fact one way or the other. There is a belief that oil will be found within our borders but as yet only a small portion of the state has been critically examined. The evidence to date for the existence of oil may be grouped under several heads as follows,--(1) Rumors. (2) Scums on ponds, springs, etc. (3) Presence in South Dakota of the same geological strata that procure oil in neighboring states. (4) Gas in springs and wells. (5) Actual collecting of oil. These will be discussed in the order given.

RUMOR--While rumor is really no evidence at all yet, because, it is accepted as such by some persons and because of its harmful effect, it needs to be referred to. Of certain parts of the state it has been said that they "look just like the oil region at X---". Where such remarks are taken seriously they have led to excitement and in some cases investment. But no one who is at all thought-

ful can place any value on such random remarks. Because one landscape superficially resembles another it does not follow that they both have the same geological conditions below ground. If an oil region can so easily be told by its "looks" why is it necessary for oil companies to employ trained geologists to examine their properties?

Some rumors are based on,--

SCUMS on PONDS, SPRINGS, etc.--It is known that oil seeping into a pool of water will form an iridescent scum on the water. But other commoner substances (especially iron oxide) will collect as scums which also have an iridescent appearance.

Of those scums examined to date none have been oil. A simple test will serve to tell an oil scum from other scums such as iron oxide. Stir the scum with a stick. The iron oxide will break up into irregular pieces while the oil will string out in lines and flowing smears. This is because at the ordinary temperature of water oil is a liquid and the oxide a solid. One should bear in mind also that oil may accidentally get into water from machinery, etc.

PRESENCE IN SOUTH DAKOTA of the SAME GEOLOGICAL FORMATIONS THAT YIELD OIL in NEIGHBORING STATES--Various members of the Cretaceous, Commanchian, Paleozoic, and other formations carry oil in the neighboring state of Wyoming. These strata occur in our own state, but as yet have not produced oil. Parts of these formations in South Dakota have been examined and no traces of oil found. Other parts have not been carefully gone over. It is possible that a thorough investigation of the whole series may bring to light oil comparable to that in Wyoming.

GAS ON WELLS AND SPRINGS--Natural gas has been known and used in the state for many years. It is found in some springs and in a large number of artesian wells in the north central part of the state in the region immediately bordering the Missouri River. Because gas and oil have a similar origin and because the two so often occur together, the presence of the gas very naturally suggest that oil may be in the same region. The presence of the gas, however, does not prove that oil is there too.

The whole region bordering the Missouri River from below Pierre to Mobridge and above has been gone over in considerable detail. The problem has been not only to look for further surface indications of oil but also to locate those places where the structure of the bed rock is suitable for the accumulation of oil, such as "domes", etc. In August 1916, Prof. J. R. Todd of the University of Kansas made a thorough study of the region about Pierre. The state geologist joined him in the work for a few days. In 1917 the state geologist continued the investigation starting above Mobridge working down stream and tying up with Prof. Todd's work near Pierre.

No domes or anticlines or favorable oil structures were found in either case. In many places the strata were seen to be disturbed but in all cases this was due to landslides. No evidence of folding or of regional disturbance was encountered.

ACTUAL COLLECTING OF OIL--In three instances oil has actually been collected and samples of it secured.

Near South Shore. Between Watertown and South Shore but nearer the latter place, oil was collected from the surface of a small stream. Following the original find excitement ran high and a well was put down. The hole was for some

reason abandoned after a depth of about 900 feet was reached. The findings are shrouded in mystery. Nor is the log of the well available.

In May, 1916, the state geologist spent part of a day in the region in company with the one who first found the oil. No formal investigation could be attempted, but the stream was visited and not a trace of oil seen.

Since then an oil company has started drilling operations again. Very little positive information has been given out. It is reported that two small pockets of oil have been encountered with some show of gas, and that drilling was to be continued to a greater depth.

There is little to warrant excitement in this field. The thick cover of glacial drift so obscures the structure below that there is little chance of locating local flexures even if they exist. From the records of wells both east and west it is expected that the barren Pre-Cambrian rock will be struck within 1500 feet.

Near McIntosh. During this past summer oil was taken from two shallow wells about three miles southeast of McIntosh. The state geologist spent about a week investigating the situation there. The region is underlain by the Lance formation. The bed rock is only partially exposed in the immediate vicinity of the wells but to the south a few miles and further to the north there are open Badlands where the characteristics and attitude of the formation are clearly shown. Reported surface indications were looked up, scums examined etc.

The conclusion is reached that the geological structure is unfavorable for the accumulation of oil. No evidence for the presence of oil was seen except that in the wells themselves. Other wells equally deep and similarly placed have secured no oil.

Near Mahto. Oil was found in water in a well just on the west edge of town this past summer. The well is in the very top of the Pierre formation. The Fox Hills formation occupies the hills immediately surrounding.

The state geologist spent several days examining conditions there, and the conclusion reached is identical with that at McIntosh.

FUTURE OF OIL IN SOUTH DAKOTA--That oil has not yet been found in our borders in paying quantities does not mean that it does not exist here. Much of the state has not been thoroughly examined; the search for this valuable material has not been completed. But as far as is known the possibilities for oil in the various sections of the state are outlined below.

Eastern Section of the State. Those portions of the state which are immediately underlain by the oil Pre-Cambrian rocks (quartzite, granite, etc.) can never hope to yield any oil. This condition holds true in a large part of Minnehaha, and McCook Counties, and portions of Moody, Lincoln, Turner, Hanson, Hutchinson, Grant and Roberts Counties. In the remainder of this section the prospects are not at all promising. Artesian wells have been put down in practically every county, the total number being several thousand. None of them have found oil. In nearly one half of the counties the drilling has penetrated the overlying formations and reached the oil Pre-Cambrian basement beneath. This rather thorough exploration by well holes is a very strong argument against the finding of oil in this eastern section of the state.

Central Section of the State. Under this heading is included the region

immediately bordering the Missouri River from the Big Bend up to the state line. This is the gas belt and has been examined in considerable detail as already described on page 2. The evidence, as stated, and including that from artesian wells, is all negative and consequently little hope can be held out of finding oil. But in one sense the question is still open. While it is true that the region... (the next two lines of the original are now illegible)...by a continuous cover of sod, brush, and piles of slide rock. In such spots no conclusion could be reached one way or the other.

In most portions of this central section, then, we cannot expect to find oil. But in certain other portions the finding of oil is within the range of possibility though the element of uncertainty must always remain large.

Western Section of the State. Parts of this section are already quite well known. The Black Hills region has been examined by a large number of geologists. Except for a showing in a deep well at Edgemont no oil has been found although in the same formation on the Wyoming side oil does occur.

The two small areas in Corson County, at Mahto and McIntosh, have been closely studied, as described on page 3. All the rest of the territory in this western section while known in a general way has not been mapped in sufficient detail to settle the oil question.

If any oil exists in this section it is not likely to be in the Dakota formation, for the artesian water moving through it for so long would have brought some trace of it into the many wells to the east. The same argument would apply to the Benton in some degree at least. It is of course possible that some structural peculiarity may allow the trapping of the oil so that it did not migrate with the water, though this is unlikely.

The formations above the Dakota have in a few cases been penetrated by deep wells and have so far yielded no trace of oil. Below the Dakota the strata are unknown, except in the Black Hills proper. All things considered, it seems that there is more chance of there being oil in the strata below than those above the Dakota; which means that deep (more than 2000 feet) holes will need to be drilled if oil is to be proven to exist at all.

Deep wells are now being started or soon will be started at a point near the state line, and at Interior. Even if unsuccessful these three holes should throw considerable light on the oil situation.

CONCLUSION---

The reported showings of oil in South Dakota are very few in number and all small in quantity.

No findings are of sufficient magnitude to cause excitement or investment.

Our knowledge of the geology of the state is by no means complete. This is especially true of the western half.

Detailed geological work is necessary to locate places where the structural conditions are favorable for the accumulation of oil.

Wells put down without this preliminary geological work to guide their location are no more than gambling ventures.

Investment must recognize the fact that South Dakota is an entirely new field. No district has yet been proven. Even where some indications of oil exist the element of uncertainty is very high. While in some parts of the state oil is a possibility, yet investment in all cases is still a decided speculation.

Freeman Ward

All inquiries should be addressed to the State Geologist, Vermillion, S. Dak.