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GEOLOGY AND PRESENT OIL & GAS DEVELOPMENT
OF THE LOST SOLDIER-FERRIS-MAHONEY DISTRICT

Since the publication of Press Bulletin No. 2 in 1919, entitled "Oil Fields North of Rawlins", much has been learned of the geology of this district and it may be of interest to the public to publish this recently acquired data, together with a review of the existing conditions in regard to the oil and gas development.

Generally speaking large possibilities of oil and gas production have been opened up in these fields within the last two years. The Little Lost Soldier field, which is the original field of this district, has increased its daily production from about 2000 barrels to 5000 barrels and the size of the field has been increased from 140 acres to probably 400 acres and possibly 450 acres.

A new gas field called the Wertz dome, located in the northwest corner of T. 26 N., R. 89 W. about $2\frac{1}{2}$ miles east of the Little Lost Soldier field, has been opened up and is producing in one well about 50 million cubic feet per day. In the Mahoney dome another gas field, of which mention was made in the former press bulletin, now contains five gas wells averaging around 30 million cubic feet.

Since the last publication on these fields, a gas pipe line has been constructed from this district to Casper by the Producers and Refiners Corporation, and a large amount of this gas is now being used at the refineries. Probably about 75% of the gas taken out and going into this pipe line is from the Wertz dome; the balance being from the Mahoney dome. The old 4" oil line from the Lost Soldier field is being replaced by a 6" line and the 4" line will probably be used for piping gas to Rawlins.

In the North Ferris field new development has opened up oil production in the Dakota sand, which was formerly thought to be entirely gas producing. It appears that below the gas pool there is a fringe of oil somewhat similar to that in the Lance Creek field, and at least one of the gas wells is now producing oil, and another well drilled outside of the gas zone in the NW $\frac{1}{4}$ of Section 25, T. 26 N., R. 87 W., recently came in for about 350 barrels and is now producing about 150 barrels of oil per day. The gas well located on Section 36 of this township, which is changing into an oil well, is barely in the top of the sand and will be drilled deeper with a probability of a very substantial production.

This North Ferris Field, although a small structure, now shows rather large possibilities in the way of future oil production.

Formerly it was thought that only a very limited production could be expected and that would be from the sandy horizon in the Howry shale. It was believed that the Dakota would be entirely a gas producing sand and that the field would be rather small in area and capacity.

There is nothing very much in the way of new development in the South Ferris or General Petroleum field. Two wells in the NW $\frac{1}{4}$ of Section 16, T. 25 N., R. 86 W. are producing about 35 or 40 barrels each, and another well in the SW $\frac{1}{4}$ of Section 9 of this township is producing a like amount. Several new wells are now being drilled in this field and a number have been abandoned. Present conditions indicate a small producing area in the NW $\frac{1}{4}$ of Section 16 and the SW $\frac{1}{4}$ of Section 9, T. 25 N., R. 86 W.

South of this field some new work is being done on the O'Brien Spring anticline in Townships 24 and 25, Ranges 86 and 87. A number of wells are being drilled on this structure, but so far, the tests have not been completed. A small gas production was found at the depth of about 3000 ft., supposedly in the Frontier formation. Efforts are being made to drill down to the Dakota sand in the hope of getting oil.

DATA ON THE GEOLOGIC AND STRUCTURAL CONDITIONS.

LITTLE LOST SOLDIER FIELD.

The most important structure from an economic standpoint is the Little Lost Soldier dome located in the northeastern part of T. 26 N., R. 90 W. Although on the general anticlinal fold paralleling the Ferris Mountains, this dome is a distinct and separate structure from the others to be described in this article.

The apex of this dome is located in the SE $\frac{1}{4}$ of the NE $\frac{1}{4}$ of Section 10. The major axis trends northwest and southeast, and the northeast flank is intersected by a number of very pronounced faults, which do not appear on the opposite side. This field lies at the extreme northwest end of the elongated basin south of the Ferris Mountains and is surrounded on three sides by an escarpment. The surface formations in the floor of this part of the basin are the Niobrara and the Steele shale. The escarpment is made up of the ridge-forming sandstones of the Mesaverde formation which is well marked by the so-called Teapot sandstones, or white sugary sandstones, resembling the Teapot sandstone in the Biguddy and Salt Creek areas. The dips are very steep on all sides ranging from 20 to 45 degrees, the greatest dips being on the northeast flank.

A stratigraphic section measured on the south slope of the Ferris mountains from the lower Teapot to the bottom of the Niobrara is as follows:

Formation	Description	Thickness ft.	Total ft.
Mesaverde	"Lower Teapot" Sugary, white, massive, cross-bedded, coarse-grained sandstone		
	Alternating beds of sandstone and shale locally contains coal,		
	Heavy buff colored, thick-bedded sandstone at base, considered base		

	of Mesaverde formation,	385 - 385
Steele	Sandy shales, with sandstone lenses and a persistent heavy sandstone at the base,	410
	Shale probably sandy in part, covered, heavy sandstone at base about 30 ft. thick, considered "Shannon Equivalent",	450
	Dark shale, mostly covered, Light colored, resistant, calcareous sandstone at base,	475
	Soft shale, mostly covered,	1100
	Shale, including three striated, limy, nodular beds, 6" to 14" thick, resembling nodules at top of Niobrara,....	425
	Dark slightly sandy shale with thin intercalated beds of Red Marl, which characterize this horizon. Pieces of this Red Marl can often be found on a surface, otherwise covered, thus marking the outcrop of the horizon,	650
	Dark sandy shale, with thin beds of shaly sandstone,	150
	Dark, greenish, sandy, current bedded shale,	475 - 4135
Niobrara	Gray calcareous shale, containing three beds of striated nodular limestone, weathering a light buff,	125
	Shale, gray to black, upper part fissile, generally calcareous. Contains Ostrea Congesta and Inoceramus Deformis in abundance,	1260 - 1385

Supplementing the above the following stratigraphic section compiled from measured sections and well logs in the Lost Soldier field shows the formations from the surface in the center of the field down to the Amsden formation.

Formation	Description	Thickness ft.	Total ft.
Niobrara	Gray calcareous shale to top of Frontier sand,	0 - 202	202
Benton	1st sand, series of thin to medium bedded sandstones, separated by varying breaks of shale, gray to green in color, (Frontier Sands),	202 - 444	
	Second oil sand,	581 - 584	

	Thin sandstone in sandy shale,	584 - 624
	Third oil sand,	875 - 895
	Fourth oil sand,	1150 -1153
	Sandy streak in shale,	1160 -1165
	Dark sandy shale,	1300 -1325
	Hard sand,	1340 -1347
	Sand carrying oil,	1375 -1387
	Dark Carbonaceous shale and coal,	1400 -1410 - 1215
Cloverly	Dakota or Muddy sand, Deep oil sand,	1417 -1441
	Dark sandy shale,	1441 -1461
	Light yellow and maroon shales and sandstones increasingly sandy toward base,	1461 -1596
	Lakota Sandstone; Hard massive Conglomeratic sandstone, shale break near middle,	1596 -1696 - 280
Morrison	Maroon sandy shale,	1696 -1751
	Light yellow shales and white to brown sandstone,	1751 -1921 - 225
Sundance	Sandy shale and sandstone,	1921 -2076
	Sandy limestone, essentially composed of shells,	2076 -2096
	Covered, probably sandy shale,	2096 -2296
	Yellow thin-bedded sandstone,	2296 -2396
	Pink and gray, thin to medium bedded sandstone with thin partings of green shale,	2396 -2546 - 625
Chugwater	Pink sandstone and Red shale,	2546 -2931
	Hard gray limestone,	2931 -2951
	Red shale,	2951 -3031
	Sugary white sandstone,	3031 -3046
	Red shale,	3046 -3238
	Red sandstone,	3238 -3258
	Red shale,	3258 -3433
	Red sandy shale,	3433 -3509
	Red shales,	3508 -3746 - 1200
	Base of Red Beds.	

Embar	White limestone, 3746-3785 3ft. Phosphate bed, 10ft. of pink shale above.
	White and pink shaly lime, 3785-3921 1 ft. bed of White lime.
	Pink and red limy shale, 3921-4346
	Hard white limestone, 4346-4361
	White Rock Gypsum, 4361-4406 - 660
Tensleep	White and Brown sandstones, 4406-4756 - 350

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It is interesting to note that there are four sands or sandy horizons producing oil in the Frontier and lower Benton formations and in addition, another oil producing sand in the Mowry shale and still another in the Dakota or upper Cloverly. All of these sands are found at comparatively shallow depths ranging from 265 feet to 1565 feet. By far the heaviest production is coming from the two lower sands. There are about thirty wells in the field, and of this number, five are deep wells and capable of producing 3500 barrels per day, or considerably more than one half of the capacity production of the field.

The principal operator in this field is the Bair Oil Company, which is under the management of the Kasoming Oil Company.

WERTZ DOME

The Wertz dome is a very small elongated structure lying in the same basin and just east of the Lost Soldier field, from which it is separated by a narrow syncline. It lies on the same comparative level floor with the other field, and also has its axis northwest and southeast. This structure lies more nearly on the major axis of the field. Its extension is probable in line with that of the Mahoney dome to the southeast.

The Wertz dome is a gas field and covers about 700 acres of land. The well drilled in Section 7, T. 26 N., R. 89 W., heretofore described as the Wertz well, is the only development in the field.

MAHONEY DOME

The next structure encountered in going from the Wertz dome in a southeasterly direction is the Mahoney dome, which is located in the southern part of T. 26 N., R. 88 W. and the southwest part of T. 26 N., R. 87 W. It is a long narrow structure with the major axis almost east and west, and probably about four sections have been proven to be gas bearing. Gas wells are located on Sections 28, 34 and 36, T. 26 N., R. 88 W. and in Section 31, T. 26 N., R. 87 W.

The Niobrara and Steele formations are exposed on the surface in this structure and the Mesaverde outcrops about a mile and a half north of the field. The dips are milder than in the Lost Soldier structure, ranging from 4 degrees to 10 degrees on the south and from 40 degrees to 60 degrees on the north.

In this structure the Frontier sands appear to be dry. The first is found at 1350 feet, the next at 1400 feet and the third at about 1450 feet. They are 50, 60 and 90 feet thick, respectively. The Dakota sand which is found at a depth of about 2600 feet is 37 feet thick and is the reservoir of the gas.

This field is destined to be one of the principal gas fields of the state and already has a capacity of 150 million feet per day. Plans are on foot to pipe gas from this field to Rawlins and other towns along the Union Pacific. It is quite within the realm of possibilities that eventually gas from this district will be piped as far as Laramie, Cheyenne and Denver especially if other important gas fields are brought in, in southern or south-central Wyoming.

NORTH FERRIS DOME.

The North Ferris dome, located in Section 25 and 36, T. 26 N., R. 87 W. and Sections 30 and 31, T. 26 N., R. 86 W. is another small structure trending in a southeast-northwest direction. The apex of the dome is near the center of Section 25 and the surface formation is Niobrara and Benton shale.

A small production of oil was found in one of the Frontier sands in the SW $\frac{1}{4}$ of Section 30, T. 26 N., R. 86 W. at a depth of about 940 feet, but this has not been a commercial well for some time. Several wells near the center of Section 25 are producing from the lower Benton and Mowry sands at depths ranging from 1300 to 1600 feet. A gas well in Section 36, T. 26 N., R. 87 W., that is now producing oil, was first drilled to a depth of 2120 feet and was afterwards deepened to 2134 feet. A new well drilled in the NW $\frac{1}{4}$ of Section 25 to a depth of about 1800 feet is believed to be in the Dakota sand, which was found to be a gas sand in the Mahoney and Wertz domes and which was also believed to be gas producing in this field.

This discovery of oil tends to enlarge the possibilities of this field and also gives certain encouragement to prospectors to drill on the flanks of the Mahoney and Wertz structures with the idea of finding oil outside of the gas zone. It is probable that the oil production from the North Ferris field will be increased from a few hundred to a thousand or more barrels per day before the season is over.

SOUTH FERRIS FIELD.

The South Ferris field, or better known as the General Petroleum camp, is located in Sections 9 and 16, T. 25 N., R. 86 W. This area is all covered, and the formations and structures concealed by wind blown sands. The sand dunes are from 25 to 150 feet in thickness. The outcrops of the Mesaverde sandstones are noticeable to the south, east and northeast of the field, dipping at angles ranging from 12 to 25 degrees. Under the sand the Steele shale is the first formation encountered.

The following section taken from well logs will give an idea of the formations in this area.

Formation	Description	Thickness ft.
	Wind blown sands	0 - 150
Steel Shale	Blue and gray shale containing hard sandstones and shells, with little gas at 500 ft.,	150-1450
Niobrara	White lime, gray sand, blue shale and sandy brown shale, containing oil sand horizon at 3000 ft.,	1450-3200

Benton	Blue and brown shale, black slate and thin limestone,	3200-4500
	Blue shale,	4550-4750
	Sandy shale and gray sand showing oil, probably second Wall Creek	4750-4775
	Blue shale,	4775-4850
	Gray sand,	4850-4860

The principal oil producing horizon in this area is a sandy shale zone near the base of the Niobrara formation. Although there is evidence of some doming here, it is probable that the oil is trapped in lenses and open places in the formation rather than being held by a closure in the structure. The structure is that of a plunging anticline striking about North 75° West, in which direction it would intersect the Mahoney dome axis to the northwest.

It is significant that commercial oil has been found only in the upper formation and that a well drilled in Section 17 to a depth of 4800 feet encountered only showings of oil in the Frontier and lower Benton formations and not much more than a showing of oil in the Niobrara. A number of wells drilled to the north and west of this small area and higher up on the general structure have not proved successful. It is probable that a very pronounced fault separates the North and South Ferris domes, but it is not believed that this has any bearing on the accumulation of oil in either structure. As stated before, the South Ferris field derives its oil from a sandy shale horizon and the oil is probably trapped by the lensing of the sands, which may be somewhat assisted by terracing in the structure.

In conclusion, I wish to make acknowledgement to Mr. E. Walter Kampert, geologist for the Kasoming Oil Company and to the Producers and Refiners corporation, the Chic Oil Company and the General Petroleum Corporation for much of the data used in this report.

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South Ferris Field
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T26N

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Mahoney and Ferris Fields.

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