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The Douglas Oil Field

Converse County
Wyoming

By C. E. JAMISON

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This reprint of Bulletin No. 3A, Series B, is made to meet the continued demand for information regarding this oil field. The original edition is all gone. To reduce the cost of printing and reduce the weight of the bulletin this reprint does not contain the halftone illustrations which appeared in the original edition. Reprint of the following oil bulletins may be had free of cost by addressing the State Geologist:

Bulletin No. 2, Oil Fields of Fremont County,

Bulletin No. 3A, The Douglas Oil Field, Converse County,

Bulletin No. 3B, Muddy Creek Oil Field, Carbon County,

Bulletin No. 4, The Salt Creek Oil Field, Natrona County.

Cheyenne, July 1, 1913.

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INTRODUCTION. In May, 1911, a brief inspection was made of the oil fields adjacent to Douglas, Wyoming, but no detailed examination was attempted until October, 1911, when field work was begun. The investigation was commenced October 3rd and was continued until October 26th, when on account of the advanced state of the season, field work was abandoned. This report is, then, based upon twenty-three days actual work in the field.

Acknowledgments are due Mr. J. Bevan Phillips and Mr. C. H. McWhinnie for much valuable information, for records of the various wells, and for many courtesies extended.

LOCATION OF THE FIELDS. For convenience the Douglas oil fields are here separated into the Brenning field, lying along the north flank of the Douglas anticline, and extending from Cottonwood creek, Township 32 North, Range 74 West, to Sand creek, Township 32 North, Range 73 West, and the La Bonte field, which lies in Townships 30, 31 and 32 North, Ranges 71 and 72 West. In the La Bonte field, about seven miles south of Douglas, a second anticlinal fold appears, called by Knight* the Phillips dome.

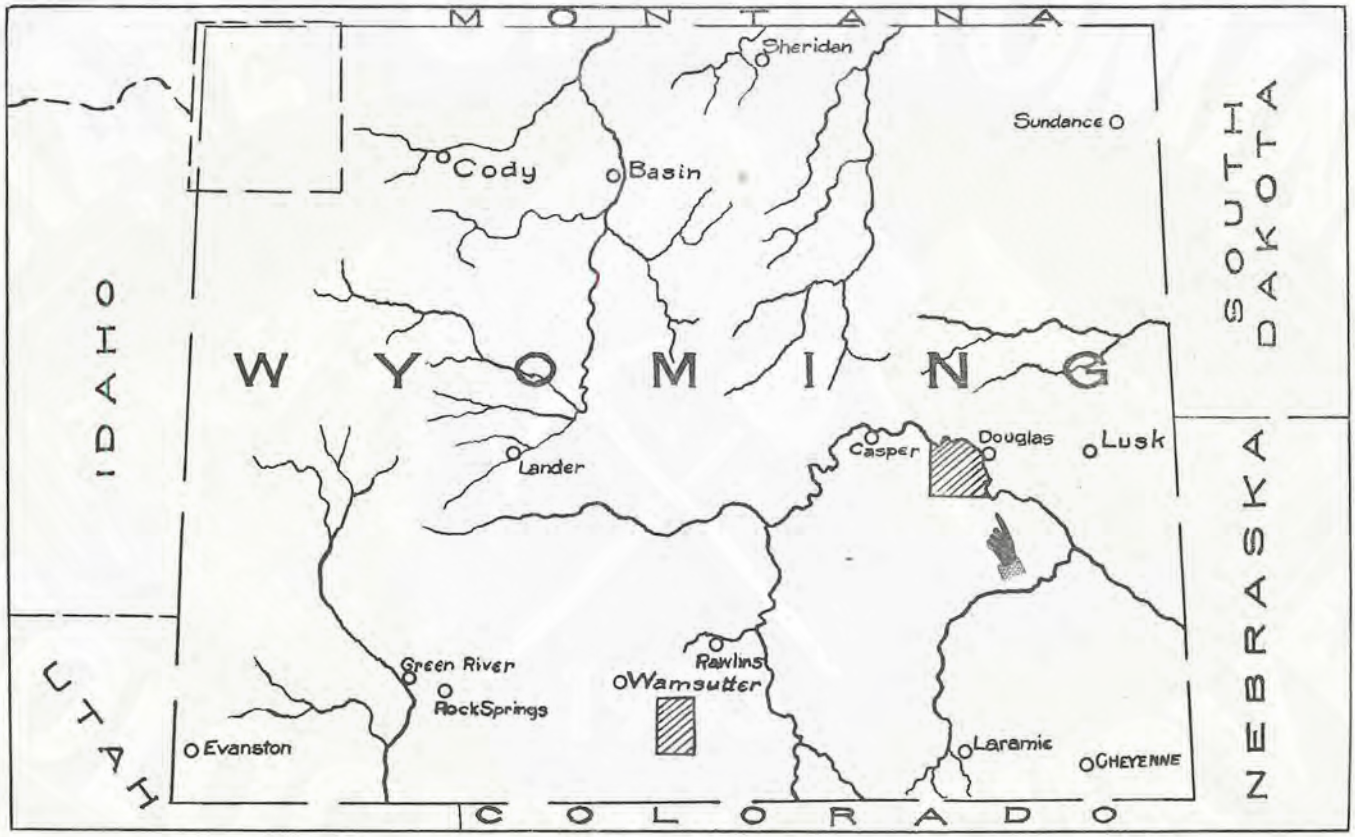
Douglas, a town of some 2,300 population, is the principal town and supply point of this region, being situated some twelve miles east of the Brenning field and seven to fifteen miles north of the La Bonte field. The oil fields are readily accessible from Douglas, wagon roads crossing the anticline at several points. Douglas is the center of a sheep raising country, supports two banks, two newspapers, and an electric lighting plant. It is the county seat of Converse county, and is the permanent site of the State Fair, the office of the secretary of the State Fair Association being located there.

Twelve miles west of Douglas is the Brenning Basin, where the principal development in the oil fields has been carried on.

TOPOGRAPHY. Viewed from a distance the region of the Douglas oil fields presents itself as a rolling plain, treeless and barren, with the Douglas anticline, and here and there an isolated butte, rising above the general level. In the Brenning Basin the post-Carboniferous strata have been cut down by erosion, and on their upturned edges beds of Tertiary age have been deposited, through which La Prele creek has cut its way. Table Mountain, a high escarpment of Tertiary sandstones and conglomerates, rises to an elevation of 500 feet or more above the level of the surrounding country, and, dipping gently to the south, forms the eastern limit of the Brenning Basin, while the southern border is formed by the long, high crest of the Douglas anticline, occupied by beds of Carboniferous age. Near the anticline are several isolated ridges and buttes of Dakota sandstone, from the foot of which the plain stretches in unbroken relief to a low, pine covered ridge of Laramie beds, some five miles northward.

In the western portion of the La Bonte field the Douglas anticline is profoundly faulted, the Carboniferous rocks disappear, and a second anticlinal fold is seen, which like the Douglas anticline, terminates in a dome near the Platte river. North

*Knight, W. C. The Bonanza, Cottonwood and Douglas Oil Fields. School of Mines, University of Wyoming; Petroleum Series No. 6. Laramie, Wyoming, 1903.



MAP OF WYOMING, SHOWING AREA DISCUSSED IN THIS BULLETIN
For information regarding Muddy Creek Field (near Wamsutter) see Bulletin 3B, Series B.

of these folds, and extending to Douglas, Tertiary sandstones, which have been carved by erosion into many picturesque, turreted buttes, prevail.

DRAINAGE. The oil fields are drained by La Bonte, Wagon Hound, Bed Tick, La Prele, Alkali and Cottonwood creeks, all tributaries of the Platte river. La Prele and La Bonte are the largest of these creeks, affording running water at all seasons of the year, while in the dry seasons water is to be found in the other creeks only near their heads. With the exception of Alkali creek, all of the above mentioned streams afford excellent water for drinking and domestic purposes. The water of Alkali creek, although strongly alkaline, is not unfit for domestic use.

GEOLOGY. The geology of the oil fields, although simple in itself, is difficult of study, as the rocks of the Triassic, Jurassic, and Cretaceous systems are, for the greater part, masked by Tertiary strata, and the structure is further complicated by a series of faults. From pre-Cambrian time to the close of the Carboniferous the strata are well exposed in the Douglas anticline, but from Carboniferous to the close of the Cretaceous era there are but few exposures, the Triassic, Jurassic, and Upper Cretaceous rocks being nowhere exposed in their full extent. In the Brenning field there are no exposures of Cretaceous rocks between the Dakota and Laramie formations, nor is the earliest Tertiary in evidence. Near the Platte river, in the La Bonte field, a portion of the Benton shales is shown, and some three miles north of the Brenning Basin is an outcrop of the middle portion of the Laramie, which extends to and beyond the Platte river north of Douglas.

Below is given a table showing the relations and general characteristics of the formations exposed in this district:

System	Group or Formation	Character	Thickness	Remarks
Quaternary		Sand and gravel.		
Tertiary	White River	Sandy shale, clayey sandstone and conglomerate.		
		Unconformity		
Cretaceous	Laramie	Yellow, purple and pink shales; brown, buff and gray sandstones.	Not fully exposed.	Coal-bearing.
	Montana-Colorado	Dark carbonaceous shales and buff sandstones.	Only lower portion exposed.	Possibly contains oil in middle and lower portions.
	Dakota sandstone.	Gray, buff, and tan shales and sandstone. Slabby brown sandstone at the top.	50 to 70	
		Unconformity?		
	Lower Cretaceous	Brown and buff shales and shaly sandstone at the top; buff sandstone and purple shale in the middle portion; soft, gray, coarse-grained sandstone at the base.	100 to 115	Contains oil in its lower portion.
Jurassic	Morrison	Pink, purple and green shales; gray and green sandstone.	Not fully exposed.	
	Sundance	Greenish-gray sandstone and shale, with several bands of fossiliferous limestone.	Not fully exposed.	
Triassic	Chugwater "Red Beds"	Red sandstones and shales with several limestone strata; gypsum near the top, a bed of yellow sandstone conglomerate near the base.	Not fully exposed.	

System	Group or Formation	Character	Thickness	Remarks
Carboniferous	Embar	Soft buff sandstone and shaly limestone; gray sandstone; all containing much chert.	100 to 125	
	Pennsylvanian and Mississippian	Soft, massive gray sandstone, cross-bedded; gray and buff limestone; gray and pink sandstones and shales; gray and tan limestone with irregular silica in its lower part.	1412 to 1555	
Cambrian	Deadwood	Drab and pink limestone; pink and purple shales and sandstones; purple and brown fine-grained conglomerates.	80 to 120	
Pre-Cambrian		Granites and schists.		Has been prospected for copper.

PRE-CAMBRIAN ROCKS. Granites and schists of pre-Cambrian age are exposed, forming the core of the Douglas anticline, near the head of Cottonwood creek in Section 13, T. 32 N., R. 74 W.; east of the La Prele reservoir in Sections 25 and 26, T. 32 N., R. 73 W.; and near Wagon Hound creek in Section 15, T. 31, N., R. 72 W.

Several attempts have been made to develop copper mines in the pre-Cambrian schists near the head of Cottonwood creek, but as yet these efforts have not met with success.

CAMBRIAN SYSTEM.—Deadwood Formation. Lying upon the schists and granites is a series of sedimentary rocks which is believed to represent the Deadwood formation of the Wind River Mountains. The formation is well exposed on Cottonwood creek in Section 13, T. 32 N., R. 74 W., where it consists of brown and purple quartzitic sandstone, 24 feet in thickness, with occasional lenticular masses of fine-grained conglomerate. Next above this sandstone are 28 feet of brown and purple shales and shaly sandstones with one foot of buff limestone at the top, which are overlain by a bed of fine-grained conglomerate, consisting principally of quartz pebbles, the largest of which are not more than two inches in diameter. The average thickness of this member is 18 feet. At the top of the formation are 38 feet of drab and pink limestone, somewhat slabby. The total thickness of this formation, as measured on Cottonwood creek, is 109 feet.

Age. No fossils were obtained from this formation but from its lithological character and stratigraphical position it is believed to be equivalent to the Deadwood formation of the Wind River Mountains, and of Middle Cambrian age.

CARBONIFEROUS SYSTEM. Forming the crest and the high outer flanks of the Douglas anticline, and extending from Wagon Hound creek, Section 23, T. 31 N., R. 72 W., to and beyond the western limits of the Brenning oil field, is a thick mass of sediments believed to be of Carboniferous age. At the top of the group are 432 feet of soft, gray, cross-bedded sandstone, probably equivalent to the Tensleep sandstone of the Wind River Mountains, underlain by 87 feet of buff and gray limestone. Below the limestone are 226 feet of pink and gray crossbedded sandstone, lying upon gray and tan limestone 21 feet in thickness. Underlying the tan limestone are 263 feet of pink and gray massive sandstone, beneath which, and resting upon the Deadwood formation, are massive gray, buff, and tan limestones, with irregular streaks of silica in the middle and lower portions. The basal limestone was found to vary from 350 feet to 430 feet in thickness.

In La Prele canyon the upper beds of this group form the crest of the Douglas anticline, making a complete arch from the Brenning Basin on the north to the La Prele reservoir on the south. At all other points, west of Bed Tick and Wagon Hound creeks, these beds form the northern limb of the Douglas anticline, appearing in a high ridge which rises from 300 to 700 feet above the surrounding country. The beds are cut by faults near La Prele canyon, T. 32 N., R. 73 W., near the head of Sand creek in Section 25, T. 32 N., R. 73 W., and on Wagon Hound creek in Section 23, T. 31 N., R. 72 W., further east of which they do not reappear. The group varies in thickness from 1412 feet on Cottonwood creek to 1555 feet on Bed Tick creek.

Fossils and Age. The middle portion of the basal limestone yielded *Chonetes loganensis* and *Spirifer centronatus*, forms characteristic of the Madison limestone, Mississippian age. The limestone beds in the middle portion of the group yielded *Spirifer sèmireticulatus*, *Productus cora* and *P. punctatus*. These forms range through both the Mississippian and Pennsylvanian series. The group is believed to be equivalent to the Tensleep, Amsden, and Madison formations of the Wind River range, though the basal limestone resembles lithologically, and may be equivalent to the Bighorn limestone, and of Ordovician age.

Embar Formation. Extending along the northern foot of the Douglas anticline is a narrow outcrop of beds, extremely cherty near the base, with sandy shales and thin limestone at the top, which, without question, represents the Embar formation of the Lander district. The outcrop is seen at most points where the Pennsylvanian beds occupy the crest of the anticline, but is broken by a number of faults which apparently do not affect the older formation.

The formation consists mostly of cherty beds with, near the top, ten feet of sandy shales overlain by five feet of slabby limestone. The lower beds are made up almost entirely of chert concretions with small amounts of limestone.

Fossils and Age. Large numbers of fossils were obtained from the sandy shales and limestone at the top of the formation, the following forms having been identified:

Spiriferina pulchra *Aviculopecten utahensis*
Productus multistriatus

The fossils listed above are found in the Embar beds of the Wind River Mountains, *Spiriferina pulchra* being especially characteristic of that formation.

TRIASSIC SYSTEM.—Chugwater Formation. Occupying the crest of the anticlines east of the Wagon Hound fault in the La Bonte field are beds of red sandstone and shale, with near the top a bed of gypsum, which are undoubtedly the representative of the Chugwater formation of the Lander region. The formation is nowhere exhibited in its full extent but it probably does not exceed 1500 feet in thickness. Beginning at La Bonte creek and extending to the Wagon Hound fault the Red Beds occupy the crest of the Douglas anticline, while on the Phillips anticline they are exposed over a wide extent of country in Township 31 North, Ranges 71 and 72 West. In the Brenning Basin region an exposure of Chugwater beds of limited extent is found near the mouth of La Prele canyon, the natural bridge in Section 21, T. 32 N., R. 73 W., being composed of yellow sandstone conglomerate which occurs near the base of the formation.

Age. No fossils were obtained from this formation but its position above beds of Carboniferous age and below known Jurassic beds leads to the belief that it is the Triassic representative in this region, though it may be Permian in part.

JURASSIC SYSTEM.—Sundance Formation. Overlying the Chugwater Red Beds is a series of gray sandstones, shales and limestones, which, where exposed, presents the features characteristic of the Sundance in other portions of Wyoming. The formation is not fully exposed in the Douglas oil fields, but in limestone beds near the top of the formation characteristic Jurassic fossils were found at several points.

Fossils and Age. The following Jurassic fossils were collected on Cottonwood creek from a bed of limestone near the top of the formation:

Belemnites densus *Camptonectes bellistriatus*
Pinna kingii

Morrison Formation. The pink, yellow and purple shales and sandstones of the Morrison formation outcrop in limited exposures at the extreme eastern and western limits of the oil fields. The formation is not exhibited in its entire thickness in this region, nor were any fossils obtained, but it is here provisionally classed as of Jurassic age

CRETACEOUS SYSTEM.—Lower Cretaceous Rocks. Overlying the variegated shales of the Morrison formation are sandstones and shales believed to be of Lower Cretaceous age, which are of importance in this district as the basal sandstone is probably the source of the oil obtained in the wells drilled in this field. These shales and sandstones, together with the overlying Dakota sandstone have heretofore been classed as the Dakota Group, comprising the Lakota, Fuson and Dakota formations of Darton*. However, at several points in this area evidences of a slight planation unconformity were noted, denoting that there was at least a short interval when this region was land, between the deposition of beds, here classed as Lower Cretaceous, and the Dakota sandstone. As no fossils were obtained from this formation by which its age could be conclusively determined no distinctive name is here proposed for it.

The formation is soft and not well exhibited, usually being partly concealed by talus from the cliffs of Dakota sandstone which occur above. In the neighborhood of Cottonwood creek the basal sandstone of the Lower Cretaceous formation, together with the Dakota sandstone, forms a high outlying ridge with a slight trough or gulch representing the upper shales of the Lower Cretaceous, between the two sandstones. At other points the Lower Cretaceous rocks form the inner slope of the Dakota hogback, being partly concealed. Sections of these beds, measured in the Brenning Basin, are given below:

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*Darton, N. H. Geology and Water Resources of the Northern Portion of the Black Hills and Adjoining Regions. U. S. Geological Survey Professional Paper 65. 1909.

Section near the Head of Alkali Creek.

Tan shale with thin brown sandstone	47 feet
Hard brown and buff sandstone	22 feet
Soft, massive, gray sandstone—the oil sand	31 feet
Total	100 feet

Section on Cottonwood Creek.

Tan shale	1 foot
Brown sandstone	2 feet
Tan shale with thin intercalated sandstone	15 feet
Brown sandstone	4 feet
Tan shale	6 feet
Brown sandstone	2 feet
Tan shale	5 feet
Green shale	1 foot
Pink shale	1 foot
Tan shale	3 feet
Purple shale	4 feet
Tan sandstone	6 feet
Tan shale	4 feet
Hard brown sandstone	29 feet
Soft, massive, coarse-grained light buff sandstone (impregnated with oil 600 feet north)	28 feet
Total	111 feet

Dakota Sandstone. The Dakota formation, consisting of brown and buff, shaly, ripple marked sandstones, is exposed to a slight extent in the Brenning Basin, and more prominently in the La Bonte oil field, between Wagon Hound and La Bonte creeks. In the Brenning field the Dakota sandstone is broken by faults at several points, its outcrop forming a number of isolated ridges, while near the western boundary of this region its course is changed by faulting from N. 70° W. to N. 6° E. East of the Wagon Hound fault, between Wagon Hound and La Bonte creeks it is well exposed, forming high flanking ridges on either side of the anticline. Sections of this formation measured in the Brenning Basin and on Wagon Hound creek are given below:

Section on Wagon Hound Creek.

Slabby brown sandstone	7.0 feet
Brown shaly sandstone, ripple marked	4.5 feet
Yellow shale	2.0 feet
Buff slabby sandstone	6.2 feet
Gray slabby sandstone	9.4 feet
Brown sandstone, ripple marked, shaly	11.0 feet
Gray shale	2.5 feet
Buff slabby sandstone	4.6 feet
Brown sandstone, ripple marked	3.5 feet
Total	50.7 feet

Section in Brenning Basin.

Brown, slabby sandstone	17.0 feet
Shaly, brown sandstone	8.5 feet
Gray sandstone	3.5 feet
Buff sandstone	3.0 feet
Gray shaly sandstone, ripple marked	4.0 feet
Brown sandstone	3.0 feet
Tan shaly sandstone, ripple marked	2.9 feet
Buff sandstone, ripple marked	1.0 foot
Gray shale	0.5 feet
Buff sandstone	0.5 feet
Gray sandstone	2.0 feet
Brown sandstone	0.5 feet
Buff shale	1.5 feet
Brown sandstone, ripple marked	1.0 foot
Yellow shale	2.5 feet
Total	51.4 feet

Age. No fossils were obtained from this formation but there seems no doubt that it is equivalent to the Dakota sandstone of the Wind River Mountains.

Fort Benton Formation. The syncline between the Douglas and Phillips anticlines, east of the Wagon Hound fault, is occupied by shales and sandstones of the Benton formation. The formation is not exposed in its entire thickness, the basal beds being concealed and the upper portion removed by erosion. However, at several points exposures of shales of the Mowry beds, and an overlying sandstone, were noted.

In the Brenning field this formation does not appear at the surface, being concealed by strata of Tertiary age, but it is, no doubt, penetrated by some of the oil wells drilled in this district. Sections of the lower part of this formation, measured in the La Bonte field, are given below:

Section on North Flank of the Douglas Anticline.

Upper portion missing.	
Sandstone, buff and yellow	17 feet
Concealed	419 feet
Shale, dark gray	4 feet
Concealed	9 feet
Shale, white, calcareous	5 feet
Concealed	91 feet
Sandstone, buff	2 feet
Concealed	59 feet
Shale, black	11 feet
Sandstone, buff	4 feet
Shale, black, partly concealed	26 feet

Section on South Flank of Phillips Anticline.

Upper portion missing.	
Shale, dark gray	71 feet
Concealed	12 feet
Shale, light gray	32 feet
Sandstone, buff	3 feet
Concealed	71 feet

Fossils. No fossils were obtained from this formation but it is unquestionably equivalent to the Ft. Benton formation.

Laramie Formation. In the extreme northern portion of this area is an outcrop of yellow, pink and purple shales, and yellow, buff and brown sandstones, which form a low ridge, a prominent landmark in this region on account of the growth of stunted pines which occupy its crest. Neither the base nor the top of this formation are exposed, but is believed to lie conformably on the Colorado-Montana group below, and to be of Lower Laramie age.

Age. In the lower part of the exposure of this formation is a stratum of dark brown sandstone which contains impressions of leaves and other plant remains. The leaves are much folded and the margins imperfect so that little can be said in regard to them, but it is believed that they represent a Laramie flora.

TERTIARY SYSTEM.—White River Formation. Rocks of Tertiary age occupy a large portion of the surface in this district, lying unconformably upon the Laramie and older formations, and in the Brenning field concealing all of the Upper Cretaceous rocks from the Dakota sandstone to the Laramie. That portion of the formation which is exposed consists of clayey sandstone, overlain by a conglomerate member made up almost entirely of granite pebbles and boulders, the latter ranging up to two feet in diameter. No fossils were obtained from this formation by the writer but remains of *Mesohippus bairdi*, *Merycoidodon gracilis*, *M. culbertsoni* and *Stylemus nebrascensis* have been obtained from these beds south of Douglas at various times. All of the above-named vertebrates are characteristic of the White River group and of middle Oligocene age.

STRUCTURE. The principal structural features of the Douglas oil fields have a general northwesterly and southeasterly trend, being roughly parallel to the main range of the Laramie Mountains. The broader features are: (1) The Douglas anticline, a rather regular fold, though broken by faults at several points; (2) A narrow, shallow syncline; (3) The Phillips anticline, a minor fold, parallel to the Douglas anticline.

The Douglas Anticline. The crest of the Douglas anticline is exposed at only

a few points in this region, though the Carboniferous beds which usually occupy the crest are found on the north flank of the anticline, extending from Wagon Hound creek to the western limits of this area. Triassic, Jurassic, and Cretaceous beds are very slightly exposed in the Brenning field on its north flank, dipping 18° to 20° north. East of Wagon Hound creek, in the La Bonte field, Triassic strata are found at its crest, with Dakota sandstone forming its flanks, dipping rather steeply to the south and gently to the north. Faults are developed at many points along the Douglas anticline, the horizontal movement ranging from a few feet to more than two miles. Along Wagon Hound creek is a large fault which has caused a displacement of about two miles horizontally and 3500 to 4000 feet vertically, bringing pre-Cambrian rocks in contact with Benton shales, In the Brenning oil field the Dakota and Lower Cretaceous rocks are much broken by faults which, while fracturing, did not cause movement in the older strata. On Cottonwood creek the strike of the Cretaceous strata is changed from N. 70° W. to N. 6° E., while on Oil Spring creek these beds are cut off by faulting and do not again appear at the surface, farther west in this district. The Douglas anticline terminates in the La Bonte field, Section 14, T. 30 N. R. 72 W. in a steep sharp dome, known as the "Poison Lake Dome".

Phillips Anticline. In the La Bonte oil field the Wagon Hound fault has exposed a minor fold, which is here called the Phillips anticline. It is exposed only in the extreme eastern portion of this district, terminating in a wide dome near the Platte river in T. 31 N. R. 71 W., Chugwater beds appearing at its crest, while Dakota sandstones occupy its flanks. West of the Wagon Hound fault the Phillips anticline does not appear at the surface and its position can only be inferred. It probably passes beneath the northern escarpment of Table Mountain, becoming flattened in the Brenning oil field to a mere flexure of the strata. The gas encountered in the Brenning field has, no doubt, accumulated along the crest of this anticline.

Section 1 Plate VI illustrates the probable position and structure of the Douglas anticline in the Brenning oil field.

OIL. The existence of oil in this district is indicated by the presence of oil saturated sandstones near La Prele Canyon and on Cottonwood Creek, and by bubbles of oil arising in the bed of Box Elder Creek about six miles west of the Brenning field. Attention was first attracted to the possibilities of the Brenning field by the discovery of oil saturated sandstone, uncovered in digging an irrigation ditch in Section 9, T. 32 N., R. 73 W., about one mile north of La Prele Canyon. The following year, 1896, the Wyoming Valley Oil Company drilled two wells, located in Sections 8 and 9, T. 32 N., R. 73 W., respectively, obtaining a small amount of oil and a considerable quantity of water in each. In 1899, E. Straup, of Pennsylvania, drilled a well on Section 9, T. 32 N., R. 73 W., obtaining gas, oil and water at a depth of 300 feet.

The Western Oil Company, (later merged into the Douglas Oil Fields, Ltd.) was formed in 1902 and took over the holdings of the Wyoming Valley Company and of Straup, and began drilling on Section 4, T. 32 N., R. 73 E. Small amounts of oil and gas were obtained, the well being pumped spasmodically during one month and yielding a total of 20 barrels of oil.

Since 1902 this company has drilled nine additional wells, obtaining gas in some and oil in others. One of the wells is estimated to yield 593,000 cubic feet of gas in 24 hours, the pressure at the well being 165 pounds per square inch. The gas from this and other wells was used for fuel under the boilers while drilling was in progress, and is now being used for fuel and lights at several of the ranches in the Brenning Basin

The Wyoming Oil & Development Company began operations in 1904 and continued to drill intermittently until the fall of 1907, 36 wells being drilled in all, oil or gas being obtained in most of them. The total oil production of this company to date is estimated to be 5,000 barrels, the best well producing from 40 to 50 barrels per day when first brought in.

The La Prele Oil Company has drilled 4 wells, obtaining gas in three.

At the present time the Douglas Oil Fields, Ltd. and the Wyoming Development Company are preparing to recommence active operations in the spring of 1913.

Wells. In the following table is given a list of the wells drilled in this field up to the present time:

No. on Map	Location	T. N.	R. W.	Section	Owner	Year dril'd	Depth	Product	Remarks
1	Brenning field	32	73	8, SE¼ SE¼	Wyo. Oil & Dev. Co.	1904	215	Oil	
2	Brenning field	32	73	8, NE¼ SW¼	Wyo. Oil & Dev. Co.	1905	655	Water	Small amounts oil and gas.
3	Brenning field	32	73	2, NE¼, SE¼	Wyo. Oil & Dev. Co.		1574	Dry	Casing collapsed, and well abandoned.
4	Brenning field	32	73	8, SE¼ SW¼	Wyo. Oil & Dev. Co.	1905	302	Water	Small amount of oil.
5	Brenning field	32	73	8, SE¼ SE¼	Wyo. Oil & Dev. Co.	1905	367	Dry	Small amount of oil.
6	Brenning field	32	73	8, NW¼ SE¼	Wyo. Oil & Dev. Co.	1905	325	Oil	
7	Brenning field	32	73	8, NW¼ SE¼	Wyo. Oil & Dev. Co.	1905	602	Oil.	
8	Brenning field	32	73	2, NE¼ SE¼	Wyo. Oil & Dev. Co.			Dry.	
9	Brenning field	32	73	9, SW¼ SE¼	Wyo. Oil & Dev. Co.		406	Gas.	
10	Brenning field	32	72	8, SE¼ NW¼	Wyo. Oil & Dev. Co.		665	Gas.	
11	Brenning field	32	73	9, SW¼ NE¼	Wyo. Oil & Dev. Co.		742	Water	Small amounts oil and gas.
12	La Bonte field	30	73	1, SW¼ SW¼	Wyo. Oil & Dev. Co.		480	Water	Small amounts of oil.
13	Brenning field	32	73	8, NE¼ SE¼	Wyo. Oil & Dev. Co.		810	Oil.	
14	La Bonte field	30	73	2, SE¼ SE¼	Wyo. Oil & Dev. Co.	1905	356	Water	Small amount of oil.
15	La Bonte field	31	73	35, SE¼ SW¼	Wyo. Oil & Dev. Co.	1905	249	Water	Small amount of oil.
16	Brenning field	32	73	8, NW¼ SE¼	Wyo. Oil & Dev. Co.	1905	632	Dry	Small amount of oil.
17	Brenning field	32	73	8, NE¼ NE¼	Wyo. Oil & Dev. Co.	1906	670	Water	Small amounts of oil.
18	Brenning field	32	73	8, NW¼ SE¼	Wyo. Oil & Dev. Co.		393	Oil.	
19	Brenning field	32	73	3, SW¼ SE¼	Wyo. Oil & Dev. Co.	1906	200	Dry	Well unfinished.
20	Brenning field	32	73	8, NE¼ SE¼	Wyo. Oil & Dev. Co.		510	Dry	Small amount of oil.
21	Brenning field	32	73	8, NE¼ SE¼	Wyo. Oil & Dev. Co.	1906	428	Oil.	
22	Brenning field	32	73	8, NW¼ SE¼	Wyo. Oil & Dev. Co.	1906	328	Oil.	
23	Brenning field	32	73	8, NE¼ SE¼	Wyo. Oil & Dev. Co.	1906	401	Oil.	
24	Brenning field	32	73	8, NE¼ NE¼	Wyo. Oil & Dev. Co.		930	Water	Small amount of oil.
25	Brenning field	32	73	9, SE¼ SW¼	Wyo. Oil & Dev. Co.	1906	425	Oil.	
26	Brenning field	32	73	9, NE¼ SE¼	Wyo. Oil & Dev. Co.	1907	767	Dry	Small amount of oil.
27	Brenning field	32	73	11, SE¼ NE¼	Wyo. Oil & Dev. Co.	1907	515	Gas.	
28	Brenning field	32	73	9, SW¼ SE¼	Wyo. Oil & Dev. Co.	1907	780	Dry	Small amount of oil.
29	Brenning field	32	73	8, NE¼ SE¼	Wyo. Oil & Dev. Co.	1907	390	Oil.	
30	Brenning field	32	73	8, NE¼ SE¼	Wyo. Oil & Dev. Co.	1907	236	Oil.	

No. on Map	Location	T. N.	R. W.	Section	Owner	Year dril'd	Depth	Product	Remarks
31	Brenning field	32	73	8, NE¼ SW¼	Wyo. Oil & Dev. Co.	1907	374	Oil.	
32	Brenning field	32	73	9, SE¼ SW¼	Wyo. Oil & Dev. Co.	1907	388	Oil.	
33	Brenning field	32	73	9, SW¼ SW¼	Wyo. Oil & Dev. Co.	1907	454	Dry	Small amount of oil.
34	Brenning field	32	73	9, SW¼ NE¼	Wyo. Oil & Dev. Co.	1907	765	Dry	Small amount of gas.
35	Brenning field	32	73	9, SW¼ NE¼	Wyo. Oil & Dev. Co.	1907	970	Dry	Small amount of oil and gas.
36	La Bonte field	32	73		Wyo. Oil & Dev. Co.		1112	Water	Gas at 760 feet. Oil and gas at 1057 feet.
P1	Brenning field	32	73	4, SE¼ SE¼	Douglas Oil Fields, Ltd.	1905	1705	Water	Small amounts of oil and gas. (Well probably entered Dakota sandstone.)
P2	Brenning field	32	73	4, SE¼ SE¼	Douglas Oil Fields, Ltd.	1905	507	Dry	Small amounts of oil.
P3	Brenning field	32	73	9, SE¼ SW¼	Douglas Oil Fields, Ltd.	1902	342	Water	Small amount of oil.
P4	Brenning field	32	73	4, SE¼ SE¼	Douglas Oil Fields, Ltd.	1902	485	Oil	Gas at 457 feet.
P5	Brenning field	32	73	3, SW¼ SE¼	Douglas Oil Fields, Ltd.	1904	563	Water	
P6	Brenning field	32	73	11, NE¼ NE¼	Douglas Oil Fields, Ltd.	1904	498	Gas.	
P7	Brenning field	32	73	12, NW¼ NW¼	Douglas Oil Fields, Ltd.	1908	493	Gas.	
P8	Brenning field	32	73	3, SW¼ SW¼	Douglas Oil Fields, Ltd.	1904	550	Dry	Small amounts of oil and gas
P9	Brenning field	32	73	3, SW¼ SW¼	Douglas Oil Fields, Ltd.	1904	526	Gas.	
P10	Brenning field	32	73	9, NE¼ NE¼	Douglas Oil Fields, Ltd.	1902	466	Gas.	
P11	Brenning field	32	73	9, NE¼ NE¼	Douglas Oil Fields, Ltd.	1903	473	Gas.	
P12	Brenning field	32	73	9, NE¼ SE¼	Douglas Oil Fields, Ltd.	1905	600	Water	
P13	Brenning field	32	73	9, NE¼ NW¼	Douglas Oil Fields, Ltd.	1908	475	Oil.	
P14	Brenning field	32	73	9, NE¼ SW¼	Douglas Oil Fields, Ltd.	1908	440	Oil.	
P15	Brenning field	32	73	9, NE¼ NW¼	Douglas Oil Fields, Ltd.	1904	388	Dry	Stopped by order of court.
P16	Brenning field	32	73	4, SE¼ NW¼	Douglas Oil Fields, Ltd.	1907	578	Dry.	
P17	Brenning field	32	73	3, SE¼ SE¼	Douglas Oil Fields, Ltd.	1905	436	Dry.	
P18									
P19	Brenning field	32	73	12, NE¼ NW¼	Douglas Oil Fields, Ltd.	1906	520	Dry	Crooked hole.
P20	Brenning field	32	73	8, NW¼ NW¼	Douglas Oil Fields, Ltd.	1905	110	Dry	Well unfinished.
P21	Brenning field	32	73	4, NW¼ SE¼	Douglas Oil Fields, Ltd.	1904	435	Gas.	
P22	Brenning field	32	74	1, NE¼ SE¼	Douglas Oil Fields, Ltd.	1905	684	Dry	Small amount of oil.

No. on Map	Location	T. N.	R. W.	Section	Owner	Year dril'd	Depth	Product	Remarks
P23	Brenning field	32	74	1, NW ¼ SE ¼	Douglas Oil Fields, Ltd.	1905	159	Dry	Small amount of oil.
P24	Brenning field	32	74	1, NW ¼ SE ¼	Douglas Oil Fields, Ltd.	1905	161	Dry	Small amount of oil.
P25	Brenning field	32	74	1, NE ¼ SE ¼	Douglas Oil Fields, Ltd.	1905	624	Dry	Small amount of oil.
P26	Irvine field	31	71	24, SE ¼ NW ¼	Douglas Oil Fields, Ltd.	1901	800	Dry	Small amount of gas.
P27	Irvine field	31	71	24, SE ¼ NW ¼	Douglas Oil Fields, Ltd.	1902	1112	Water	Small amount of oil and gas.
P28	La Bonte field	32	72	23,	Douglas Oil Fields, Ltd.	1902	617	Water	Small amount of oil.
P29	Isabel				Douglas Oil Fields, Ltd.	1903	258	Dry	Small amount of oil.
P30	Brenning field	32	74	7, SE ¼	Douglas Oil Fields, Ltd.	1904	420	Water	Small amount of oil and gas.
P31	Isabel				Douglas Oil Fields, Ltd.	1905	492	Dry.	
L1	Brenning field	32	73	3, SW ¼ SE ¼	LaPrele Oil Co.			Gas.	
L2	Brenning field	32	73	3, SW ¼ SE ¼	LaPrele Oil Co.			Gas.	
L3	Brenning field	32	73	3, SW ¼ SE ¼	LaPrele Oil Co.			Gas.	
L4	Brenning field	32	73	2, SW ¼ SW ¼	LaPrele Oil Co.			Gas.	

Descriptive Notes on Wells Listed in Table

4. Wyoming Oil & Development Co. SW. ¼ Sec. 8, T. 32 N. R. 73 W. This well was sunk too near the outcrop of the Dakota and Lower Cretaceous sandstones to obtain oil. The Dakota was probably entered at 48 feet, and the Morrison at 272 feet. The well was located near one of the fault planes of this region, which probably accounts for the water at 294 feet.

Section of Wyoming Oil & Development Company's Well No. 4.

0- 48 feet	Wash and brown gumbo.
48- 50 feet	Oil sand, dark lubricating oil.
50- 70 feet	Brown shale.
70- 77 feet	Oil sand.
77- 97 feet	Shale.
97-128 feet	Black gumbo.
128-238 feet	Brown shale.
238-245 feet	Black gumbo.
245-255 feet	Coarse rock.
255-262 feet	Lead-colored gumbo.
262-272 feet	Wash.
272-278 feet	White gumbo.
278-282 feet	Dark shale.
282-284 feet	Wind cap rock.
284-302 feet	White water sand. Water overflows hole.

Water at 80, 254 and 294 feet.

5. Wyoming Oil & Development Co. SE. ¼ Sec. 8, T. 32 N. R. 73 W. Like No. 4, this well was too close to the outcrop to obtain oil. The oil stratum in the Lower Cretaceous has not yet been reached.

Section of Wyoming Oil & Development Company's Well No. 5.

0- 25 feet	Wash.
25- 55 feet	Gray shale.
55-108 feet	Blue and gray shale. Good oil showing.
108-110 feet	Brown sugary oil sand. Gas and oil. Gas burned over the hole.
110-140 feet	Yellow shale.
140-145 feet	Greenish sand. Good oil showing with some gas.
145-160 feet	Gray shale.
160-165 feet	Brown gumbo.
165-300 feet	Brown shale showing oil and some gas.
300-305 feet	Purple and lilac gumbo.
302-365 feet	Sandstone.

Water at 55 feet.

6. Wyoming Oil & Development Co. SE. ¼ Sec. 8, T. 32 R. 73. Although it is stated in the record of this well that the sandstone in which oil was obtained is of Dakota age, such is not the case. The Lower Cretaceous sandstones, which are believed to be the source of the oil, would be encountered in this well at from 340 to 400 feet greater depth. The oil in this and other wells in the Brenning field has leaked upward along fault planes, and has accumulated in the various sandstones in the Benton formation, usually below beds of bentonite which form an impervious barrier to its further progress.

Record of Wyoming Oil & Development Company's Well No. 6.

0- 65 feet	Gravel and sand.
65-127 feet	Green shale.
127-165 feet	Gray shale.
165-175 feet	Green oil sand.
175-215 feet	Light gray shale with a pink tint.
215-255 feet	Brown clay.

255-295 feet ..... Black shale.
295-300 feet ..... Black sand.
300-305 feet ..... Gray shale and sand.
305-311 feet ..... Dark gray shale and sand.
311-324 feet ..... Black clay.
324-325 feet ..... Dakota sand. Struck oil.
Water at 65 feet.

7. Wyoming Oil & Development Co. SE. ¼ Sec. 8, T. 32 N. R. 73 W. Dakota sandstone is reported as having been encountered in this well. However, it is probable that the bottom of the well is in one of the sandstones of the Benton formation.

Section of Wyoming Oil & Development Company's Well No. 7.

0- 74 feet Gravel wash and gray shale.
74-124 feet Brown shale.
124-184 feet Gray shale.
184-220 feet Brown and gray shale.
220-270 feet Blue and brown shale.
270-296 feet Brown dope. Very slow drilling.
296-346 feet Gray rock, shell, mixed with yellow shale and a little sand. Turned into a brown dope which stands up well.
346-356 feet Benton shale. Caves badly.
356-363 feet Paraffin.
363-405 feet Benton shale.
405-415 feet Gray shale. Very good oil showing.
415-423 feet Gray shale, black dope and a little Benton sand. Oil.
423-600 feet Benton shale.
600-601 feet Artesian water sand.
601-602 feet A pinch of Dakota oil sand.
Water at 74, 220 and 601 feet.

Note.—"Paraffin" where occurring in the well records probably refers to bentonite.

9. Wyoming Oil & Development Co. SE. ¼ Sec. 9, T. 32 N. R. 73 W. This well, which produces gas, is located on or near the crest of the Phillips anticline.

Section of Wyoming Oil & Development Company's Well No. 9.

0- 55 feet ..... Dark gray shale.
55-130 feet ..... Light green shale.
130-160 feet ..... Blue shale.
160-190 feet ..... Light brown shales.
190-250 feet ..... Light blue shale.
250-337 feet ..... Brown and slate-colored shale.
337-370 feet ..... Light brown shale.
370-405 feet ..... Slate-colored shale.
405-406 feet ..... Gas sand.
Water at 55 feet.

10. Wyoming Oil and Development Co. NW. ¼ Sec. 8, T. 32 N. R. 72 W. Located near the north escarpment of Table Mountain and on or near the crest of the Phillips anticline.

Section of Well.

0- 97 feet .... Green shale.
97-175 feet .... Brown shale and gumbo.
175-275 feet .... Gray sand rock with streaks of bluish shale. Sand streaks carry a little gas and a showing of oil.
275-285 feet .... Chalky formation.
285-380 feet .... Gray sand rock with streaks of bluish shale. Sand carries a little gas and a showing of oil.
380-665 feet .... Benton shale. Gas at 665 feet.
Water at 200 and 300 feet.

13. Wyoming Oil & Development Co. SE. ¼ Sec. 8, T. 32 N. R. 73 W.

0- 10 feet ..... Water formation.
10- 80 feet ..... Brown lime.
80-120 feet ..... Gray shale.
120-190 feet ..... Blue shale.
190-212 feet ..... Blue gumbo.

212-262 feet .....Brown and green gumbo.
262-275 feet .....Crystal formation.
275-285 feet .....Blue gumbo.
285-310 feet .....Pink and brown formation.
310-332 feet .....Mixed shale.
332-520 feet .....Benton shale.
520-528 feet .....Water sand.
528-529 feet .....Hard shell rock strong with gas.
529-547 feet .....Black sand.
547-646 feet .....Benton shale.
646-651 feet .....Paraffin.
651-718 feet .....
718-725 feet .....Oil sand.
725-739 feet .....
739-740 feet .....Hard sand rock cap.
740-748 feet .....Benton shale.
748-810 feet .....Black gumbo.
Water at 36, 217, 524, 560 and 665 feet.

22. Wyoming Oil & Development Co. SE. ¼ Sec. 8, T. 32 N. R. 73 W. This well, which is the most productive oil well yet drilled in the field, produces when pumped about 20 barrels of oil per day, the total production to date being 2000 barrels.

Section of Wyoming Oil & Development Company's Well No. 22.

0- 50 feet .....Clay.
50- 80 feet .....Blue rock.
80-185 feet .....Clay.
185-255 feet .....Green shale.
255-300 feet .....Black shale.
300-328 feet .....Black shale and paraffin. Struck oil at 325 feet.
Water at 80 feet.

23. Wyoming Oil & Development Co. SE. ¼ Sec. 8 T. 32 N. R. 73 W. This well was drilled about 1,000 feet east of well No. 22. A showing of gas is reported at 312 feet.

Section of Wyoming Oil & Development Company's Well No. 23.

0- 10 feet .....Surface..
10- 90 feet .....Gray shale.
90-140 feet .....Gumbo.
140-150 feet .....Gray shale.
150-165 feet .....Brown gumbo.
165-175 feet .....Blue shale.
175-190 feet .....Gray shale.
190-240 feet .....Light shale.
240-245 feet .....Sand rock.
245-266 feet .....Gumbo.
266-295 feet .....Yellow shale.
295-399 feet .....Black shale.
399-401 feet .....Oil sand.
Water at 65, 145 and 355 feet.

24. Wyoming Oil & Development Co. NE. ¼ Sec. 8, T. 32 N. R. 73 W. This well, which is the most northerly of the wells drilled by the Wyoming Oil & Development Company, is located near the trough of the small syncline between the Douglas and Phillips anticlines. A showing of oil is reported at 768 feet. Artesian water at 675 feet.

Section of Wyoming Oil & Development Company's Well No. 24.

0- 10 feet .....Light clay.
10- 15 feet .....Granite.
15- 60 feet .....Light shale.
60-120 feet .....
120-153 feet .....Light clay.
153-295 feet .....Clay and blue shale.
295-310 feet .....Red rock.
310-345 feet .....Yellow rock.

345-675 feet .....Black shale.
675-702 feet .....Black sand.
702-705 feet .....Black shale and paraffin.
705-714 feet .....Black shale.
714-720 feet .....Black sand.
720-831 feet .....Black shale and paraffin.
831-872 feet .....Gray shale and paraffin.
872-891 feet .....Soft gray sand.
891-900 feet .....Black and gray shale.
900-910 feet .....Gray shale.
910-925 feet .....Black shale and iron.
925-930 feet .....Paraffin.

Water at 60, 655, 675 and 930 feet.

25. Wyoming Oil and Development Co. SW. ¼ Sec. 9, T. 32 N. R. 73 W. Compare the record of this well with those of wells Nos. 32 and P3 which are distant 250 and 200 feet, respectively.

Section of Wyoming Oil & Development Company's Well No. 25.

0- 65 feet .....Light clay.
65- 70 feet .....
70-323 feet .....Green shale.
323-340 feet .....Sand and gumbo.
340-365 feet .....Black shale.
365-420 feet .....Black shale and paraffin.
420-425 feet .....Oil sand.

Water at 70 feet.

32. Wyoming Oil & Development Co. SW. ¼ Sec. 9, T. 32 N. R. 73 W. Compare with wells Nos. 25 and P3, distant 250 feet and 300 feet, respectively.

Section of Wyoming Oil & Development Company's Well No. 32.

0- 50 feet .....Clay.
50-280 feet .....Green shale.
280-340 feet .....Black shale.
340-386 feet .....Black shale and paraffin.
386-388 feet .....Oil sand.

Water at 50 feet. Oil rises to within 50 feet of the surface.

P1. Douglas Oil Fields Ltd. SE. ¼ Sec. 4, T. 32 N. R. 73 W. The Dakota sandstone was probably entered in this well at 1448 feet, the well continuing in that formation to the bottom. The well was abandoned on account of a crooked hole. If the hole were straightened and the well continued some 200 to 300 feet it would penetrate the Lower Cretaceous sandstones and add greatly to the knowledge of the underground conditions in this district.

Section of Douglas Oil Fields, Ltd. Well No. P1.

0- 420 feet .....White and green shale.
420- 473 feet .....Red rock.
473- 501 feet .....Coarse sand.
501- 504 feet .....Finer sand.
504- 524 feet .....Harder and finer sand.
524-1420 feet .....Black shale.
1420-1427 feet .....Sand.
1427-1428 feet .....Black shale.
1428-1448 feet .....Hard sand with white iron.
1448-1490 feet .....Very hard sand.
1490-1500 feet .....Very hard sand.
1500-1505 feet .....Softer sand.
1505-1530 feet .....Hard sand.
1530-1565 feet .....Softer sand.
1565 1595 feet .....Very hard sand.
1595-1705 feet .....Black shale.

Water at 8, 498, 710, 815, 1420 and 1448 feet.

Showings of gas are reported at 484 to 487 feet. Showings of oil at 488 to 498 feet, at 501 to 504 feet, at 524 feet.

P3. Douglas Oil Fields Ltd. SW. ¼ Sec. 9, T. 32 N. R. 73 W. Compare with wells Nos. 25 and 32 which are distant 200 feet and 300 feet respectively. Showing of oil is reported at 220 to 230 feet.

Section of Douglas Oil Fields Ltd. Well No. P3.

0-118 feet	Made land and sedimentary formation.
118-140 feet	Red rock.
140-160 feet	Light shale.
160-200 feet	Black shale.
200-220 feet	Light shale.
220-230 feet	Sand.
230-241 feet	Fine white sand.
241-245 feet	Gray soft sand.
245-252 feet	Light gray soft sand.
252-257 feet	Light and red shales.
257-267 feet	Darker shale.
267-285 feet	Black shale.
285-289 feet	Sand with coarse pebbles.
289-315 feet	Fine white sand.
315-330 feet	Coarse white sand.

Water at 241 and 289 feet.

P6. Douglas Oil Fields Ltd. NE. ¼ Sec. 11, T. 32 N. R. 73 W. This well is located about 1000 feet west of the west escarpment of Table Mountain, on or near the crest of the Phillips anticline. Gas was struck at 480 and 491 feet. The gas pressure as shown by the gage is 145 pounds.

Section of Douglas Oil Fields Ltd. Well No. P6.

0-480 feet	Shale.
480-486 feet	
486-491 feet	Red rock.
491-498 feet	Gas sand.

P7. Douglas Oil Fields Ltd. NW. ¼ Sec. 12, T. 32 N. R. 73 W. This well is located about 12200 feet east of well No. P6.
is located about 1200 feet east of well No. P6.

Section of Douglas Oil Fields Ltd. Well No. P7.

0- 50 feet	Surface dirt.
50- 54 feet	Blue shale.
54- 60 feet	Gray and brown shale.
60-120 feet	Blue sand.
120-145 feet	Brown sandy shale.
145-160 feet	Clay.
160-200 feet	Green shale.
200-210 feet	Light gray shale.
210-213 feet	Sand.
213-271 feet	Light shale.
271-358 feet	Red rock mixed with green shale.
358-373 feet	Green shale.
373-388 feet	Green and red shale.
388-455 feet	Green shale.
455-475 feet	Red rock.
475-480 feet	Gray shale.
480-488 feet	Red rock.
488-491 feet	Gray rock.
491-493 feet	Gas sand.

Water at 60 feet.

P10. Douglas Oil Fields Ltd. NE. ¼ Sec. 9, T. 32 N. R. 73 W. Gas was struck at 375, 454 and 463 feet.

Section of Douglas Oil Fields Ltd. Well No. P10.

0-375 feet	Blue and green shale.
375-380 feet	
380-412 feet	Green and light blue shale.
412-451 feet	Red rock.
451-454 feet	Green shale.
454-455 feet	Sand with green shale.
455-457 feet	Soft green shale.
457-460 feet	Sand and shale.
460-463 feet	Fine white sand.
463-466 feet	Sand. Strong flow of gas.

Water at 48 and 375 feet.

P11. Douglas Oil Fields Ltd. NE. ¼ Sec. 9, T. 32 N. R. 73 W. This well is drilled 1000 feet east of well No. P10, in the northwest corner of Sec. 9. A strong flow of gas, which threw sand and pebbles 70 feet into the air, was struck at 468 feet.

Section of Douglas Oil Fields Ltd. Well No. P11.

0-308 feet	Shale.
308-310 feet	Coarse white sand.
310-408 feet	Shale.
408-432 feet	Pale pink shale.
432-458 feet	Red shale. Hole caved badly.
458-468 feet	Green shale and gray sand.
468-470 feet	Gas.

Water at 12 and 22 feet.

P13. Douglas Oil Fields Ltd. NW. ¼ Sec. 9, T. 32 N. R. 73 W. This well is located about 500 feet north of well No. P3. Gas was struck at 326 feet. Small quantity of oil at 450 feet.

Section of Well.

0- 55 feet	Clay.
55- 60 feet	Green shale and clay.
60-318 feet	Green shale.
318-326 feet	Red rock.
326-334 feet	Gas sand.
334-345 feet	Yellow rock and light shale.
345-363 feet	Yellow rock.
363-405 feet	Black shale.
405-450 feet	Black shale and paraffin.
450-455 feet	Oil sand.
455-468 feet	Gray shale.
468-475 feet	Black shale.

P14. Douglas Oil Fields Ltd. SW. ¼ Sec. 9, T. 32 N. R. 73 W. This well is located 150 feet northwest of well No. P13. Gas was struck at 345 feet. Oil was struck at 435 feet. Oil rose to within 20 feet of the surface.

Section of Well.

0- 60 feet	Clay.
60-327 feet	Green shale.
327-335 feet	Red rock and green shale.
335-340 feet	Yellow rock.
340-345 feet	Gas sand.
345-350 feet	Yellow rock.
350-395 feet	Black shale.
395-435 feet	Black shale and paraffin.
435-440 feet	Oil sand.

P21. Douglas Oil Fields Ltd. SE. ¼ Sec. 4, T. 32 N. R. 73 W. A large flow of gas and a small amount of oil were struck at 433 feet. Gas from this well is now being used for fuel and lighting at the Douglas Oil Fields camp.

Section of Well.

0-345 feet	Shale.
345-390 feet	Soft green shale.
390-427 feet	Pink shale.
427-430 feet	Soft gray sand.
430-433 feet	Soft pink shale.
433-435 feet	Hard sand.

P22. Douglas Oil Fields Ltd. SE. ¼ Sec. 1, T. 32 N. R. 74 W. This well was drilled on Cottonwood creek, about 1000 feet east of the oil seepage on Oil Spring creek. The location of this well, like wells P23, P24 and P35, was evidently determined by the oil seepage. The dip of the strata at this point is 42° and the well is located near the line of the oil spring fault. It is probable that the bottom of this well is in Benton shales. Showings of oil are reported from 238 to 250 feet and at 432 feet.

Section of Well.

0- 11 feet	Coarse gravel.
11- 19 feet	Gravel and clay.
19- 54 feet	Sandy clay.
54- 96 feet	Red and light blue sandy clay.

96-105 feet ..... Gray sandy clay.
105-119 feet ..... Red and gray sandstone.
119-131 feet ..... Reddish clay.
131-180 feet ..... Hard black shale.
180-211 feet ..... Black sandy shale with streaks of white shale.
211-238 feet ..... Blue shale with streaks of sand.
238-246 feet ..... Black sandy shale.
246-250 feet ..... Sand rock.
250-432 feet ..... Black shale.
432-515 feet ..... Sand rock.
515-525 feet ..... Dark blue shale.
525-543 feet ..... Blue shale with streaks of sand.
543-551 feet ..... Blue sandy shale.
551-556 feet ..... Blue shale with streaks of sand rock.
556-559 feet ..... Black shale.
559-562 feet ..... Soft sand.
562-647 feet ..... Brown shale.
647-684 feet ..... Black sandy shale.

P27. Douglas Oil Fields Ltd. NW. ¼ Sec. 24, T. 31 N. R. 71. W. Showing of oil at 770, 1057, 1070 and 1112 feet. Gas at 317, 760 and 1057 feet.

Section of Well.

0- 26 feet ..... Loam and gravel.
26- 294 feet ..... Black and light shales.
294- 300 feet ..... Sand rock..
300- 310 feet ..... Shale.
310- 317 feet ..... Sand rock.
317- 540 feet ..... Shale.
540- 547 feet ..... Sand rock.
547- 640 feet ..... Shale.
640- 645 feet ..... Limestone.
645- 745 feet ..... Shale.
745- 760 feet ..... Hard shells and sand rock.
760- 770 feet ..... Sand rock.
770- 802 feet ..... Shale.
802- 806 feet ..... Sand rock.
806- 817 feet ..... Shale.
817- 821 feet ..... Soapstone.
821- 860 feet ..... Shale.
860- 868 feet ..... Gray sand rock.
868-1002 feet ..... Black shale.
1002-1005 feet ..... Soapstone.
1005-1030 feet ..... Shale.
1030-1046 feet ..... Dark gray sand rock.
1046-1050 feet ..... White sand rock.
1050-1112 feet ..... Sand rock.

Water at 300, 317, 800 and 1050 feet.

CHARACTER OF OIL. The oils thus far produced in this district are of two varieties, that obtained in the upper portion of the Benton formation being a heavy lubricating oil, while that produced from the lower Benton formation and Lower Cretaceous rocks is a rather high-grade illuminant.

The upper Benton oil is black by reflected, and slightly green by transmitted light. An analysis of this oil is given below, Dr. F. Salathe analyst:

	Specific gravity	Degrees Beaume	Flash	Fire	Per cent. from crude
Crude oil	0.9715	14.1	316	345	100.0
Crude refined	0.9459	18.0			87.0
Light lubricating	0.9121	23.5	266	312	21.8
Medium lubricating	0.9390	19.1	305	350	28.2
Heavy lubricating.....	0.9749	13.6	460	505	25.0
Residue	0.9957	10.4			25.0

"The crude oil contains about nine per cent. of water in an emulsified state. By distillation after complete elimination of the water the above lubricating oils were separated. They are of excellent quality."

The oil obtained in the lower portion of the Benton formation is entirely different from the above as shown by the following analysis, furnished by Mr. C. H. McWhinnie:

Specific gravity	36° to 41° Beaume
Gasoline—72° B.	13 per cent.
Kerosene—42° B.	40 per cent.
Lubricating oils	45 per cent.
Residue	4 per cent.

"The oil is of paraffin base and contains no sulphur."

A sample of oil obtained by distilling several pounds of the oil-saturated Lower Cretaceous sandstone was analysed by Slosson* with the followng results:

	Boiling point	Specific gravity	Degrees Beaume	Per cent.
Crude oil		.9120	22.1	
Sample No. 1	Below 170° C.	.8160	41.6	10.8
Sample No. 2	170°—220°	.8450	35.7	14.5
Sample No. 3	220°—270°	.8920	27.0	16.0
Sample No. 4	270°—290°	.9100	23.8	13.3
Sample No. 5	290°—320°	.9250	21.3	10.8
Sample No. 6	Residuum			34.6

Future Development. It should be borne in mind that it is not possible to positively determine, by an inspection of the surface, the occurrence or non-occurrence of oil in any locality. Where a proven territory is nearby the records of the wells may be studied and some knowledge of the underground conditions gained, though even in such territory the records vary with the varying moods and vocabularies of the drillers. In the Douglas oil fields the records of the greater number of wells are of little value. Beds of "paraffin" are reported, ranging in thickness from one to 152 feet, "black shale and paraffin" being the most common notation. The records are further complicated with such terms as "wind rock", "dope" and "rock", while wells drilled side by side apparently have nothing in common. However, it is probable that, with the exception of well No. 4 drilled by the Wyoming Oil & Development Co., none of the wells have reached the oil-bearing Lower Cretaceous sandstones. The oil thus far obtained is thought to have seeped along fault planes until its further progress was stopped by beds of shale and clay, which, being more elastic than the older sandstones, did not yield readily to the forces producing faulting and have sealed the fissures. This hypothesis is to some extent borne out by the fact that in the greater number of cases oil is reported immediately below beds of "paraffin", "gumbo" or "dope". However, it is not yet definitely known whether the oil reservoir lies in the Lower Cretaceous beds or in the sands in the lower portion of the Benton formation.

In view of the contradictory records of the different wells and the slight knowledge of underground structural conditions which can be obtained from them, and until wells are drilled which have penetrated the Lower Cretaceous strata, the best that can be done is to point out in a general way that portion of the region which seems to give the greatest promise for future development.

Brenning Field. The wells in which gas has been obtained in this field are located at or near the crest of the Phillips anticline. It is thought that oil would be obtained in wells drilled in the northern half of the first tier of sections in township 32, at depths ranging from 1500 to 2000 feet. Further north it is not improbable that oil may be obtained, though at increasing depths. It should be borne in mind that the oil sand of the Salt Creek field, which lies near the top of the Benton formation, will probably be encountered in wells drilled between the northern boundary of township 32 and the Laramie hills, and oil may be obtained from it. Well No.

*Slosson, E. E. School of Mines, University of Wyoming; Petroleum Series No. 6. Laramie, Wyoming, July, 1903.

P1, owned by the Douglas Oil Fields Ltd., should be continued to some 300 feet greater depth. The results obtained in this well would add greatly to the knowledge of underground conditions, and deductions might then be drawn as to the probable value of lands lying further north.

The existence of oil seepages, the small amounts of oil obtained in some of the wells, and the geological conditions are promising. The accumulation of gas along an east-west line about 1½ miles north of the outcrop of Dakota sandstone indicates the presence of the Phillips anticline in this field. It is thought that in the district between the Dakota outcrop and the gas wells the structure is not favorable to the occurrence of large reservoirs of oil.

La Bonte Field. But little work has been carried on in the La Bonte field, and that of a desultory character. Showings of oil and gas are reported in wells drilled in Sections 1 and 2, T. 30 N., R. 73 W., and Section 35, T. 31 N., R. 73 W. However, such showings were probably obtained from strata in the Benton formation, as the Lower Cretaceous rocks would here be encountered only at depths of 3,000 feet or more. It is not improbable that oil may be obtained by drilling south of the Poison Lake dome, within one-half mile of the Dakota outcrop, but drilling should not be resumed in this field until the existence or non-existence of oil in paying quantity is proven in the Brenning field by further drilling.

Several wells have been drilled in the Red Beds near the Platte river. Such wells can obtain oil only from the Embar formation, which is the source of the fuel oil produced in the Dallas field, Fremont county. The Embar beds were closely examined near Cottonwood creek but no evidence of oil was noted.*

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*Recently, June 1912, the region south of Glenrock, some 12 miles east of the Brenning field, was visited and the location of the oil seepage on Box Elder Creek determined. The oil was found to be escaping from sandstones in the Embar formation, the location of the seepage being in the bed of Box Elder Creek. The oil is dark brown in color, of asphaltum base, and is apparently similar to that produced in the Dallas field near Lander. In the light of this later discovery it seems probable that oil may be obtained by drilling into the Embar beds along the north flank of the Douglas anticline.

Reprint of

Bulletin 3B Series B

The Muddy Creek Oil Field

Carbon County
Wyoming

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By C. E. JAMISON

L. W. TRUMBULL
State Geologist

CHEYENNE, WYO.
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This reprint of Bulletin No. 3B, Series B, is made to meet the continued demand for information regarding this oil field. The original edition is all gone. To reduce the cost of printing and reduce the weight of the bulletin this reprint does not contain the halftone illustrations which appeared in the original edition. Reprint of the following oil bulletins may be had free of cost by addressing the State Geologist:

Bulletin No. 2, Oil Fields of Fremont County,

Bulletin No. 3A, The Douglas Oil Field, Converse County,

Bulletin No. 3B, Muddy Creek Oil Field, Carbon County,

Bulletin No. 4, The Salt Creek Oil Field, Natrona County.

Cheyenne, July 1, 1913. L. W. TRUMBULL,
State Geologist.

The Muddy Creek Oil Field

Carbon County, Wyoming

By C. E. JAMISON

INTRODUCTION. In the valley of Muddy Creek, southwestern Carbon County, Wyoming, are outcrops of oil-saturated sandstone, which, although known for many years, have attracted but little attention. It is the purpose of this report to briefly describe the geological features of the district.

The Muddy Creek oil field lies in Muddy Basin, Townships 15, 16, 17, and 18 north; Ranges 92 and 93 west. Rawlins is distant 36 miles northeast, Wamsutter 24 miles northwest, and Creston 16 miles north, the last named place being the nearest railway point. The greater part of the field lies within the limits of the Union Pacific Land Grant, all odd-numbered sections within the grant being controlled by that company.

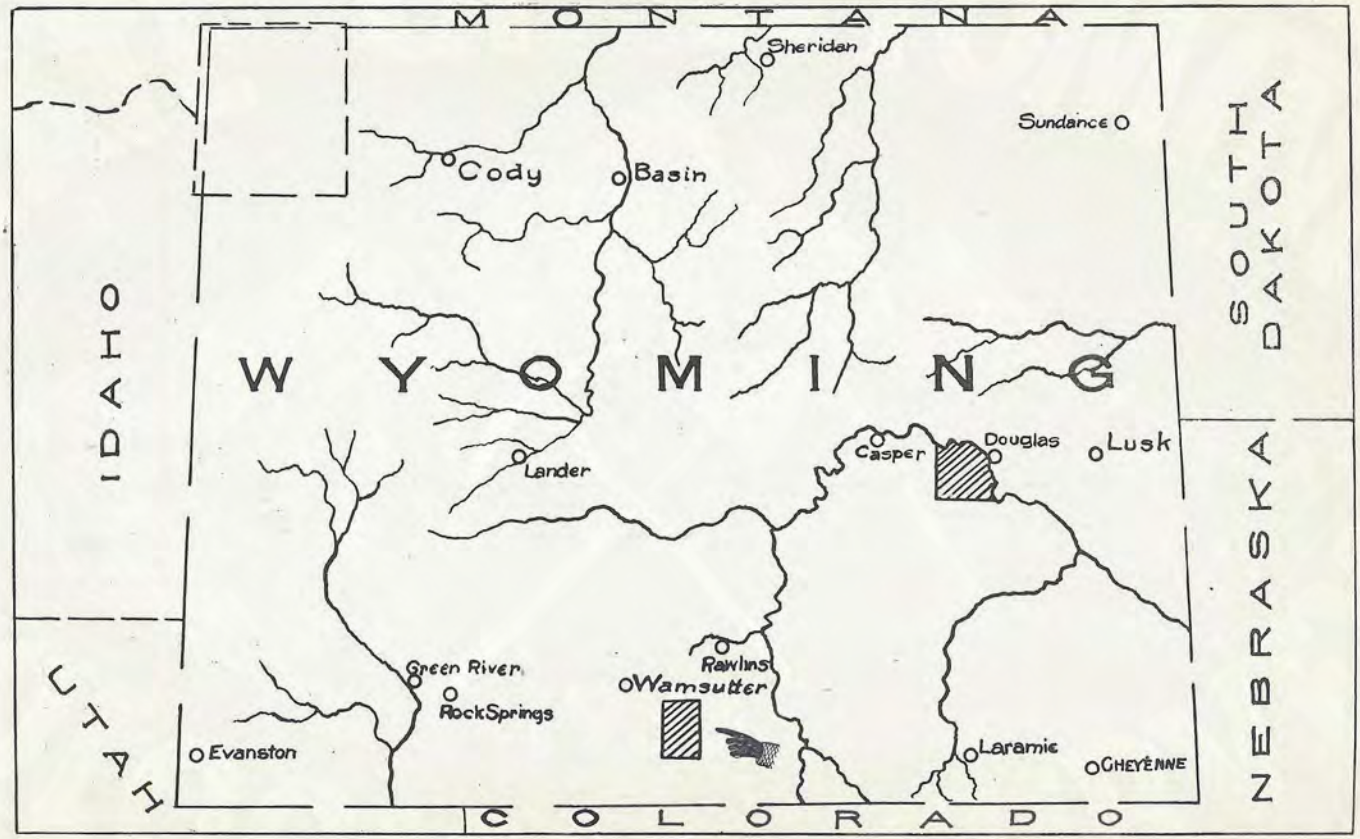
The investigation on which this report is based was made in the spring of 1912, and extended over a period of eight days. Acknowledgments are due Mr. H. Larsen of Rawlins and Mr. B. C. Hoffhine of Cheyenne for information and assistance. L. M. Trask of Cheyenne acted as field assistant during the investigation.

TOPOGRAPHY. The field lies in the drainage basin of Muddy Creek, the surface features consisting of shallow valleys and low ridges, having a general north-south trend. On the east the field is flanked by the comparatively high ridges of the Fort Union and Laramie formations, while on the west it extends to the high plateau which forms the western limit of the Muddy Basin. West of the Muddy Basin is a broad, flat plateau which extends to Wamsutter and beyond the limits of the area under discussion. Elevations in the field range from 6,500 to 7,000 feet, as determined by aneroid, while the elevation at Wamsutter is 6,702 feet.

GEOLOGY.—Structure. Between the Rock Springs dome on the west and the Sierra Madre uplift on the east is the Wamsutter syncline, the upper portion of the eastern limb being occupied by the Muddy Creek oil field. The structure in the oil field is extremely simple, the beds dipping regularly to the west. The dip of the Fort Union and older formations ranges from 12° to 15°, while that of the overlying Wasatch beds varies from 3° to 10°. No faults whatever were noted in the district.

Stratigraphy. In the following table the formations exhibited in this district are listed, together with a generalized statement as to their character, thickness, etc.:

System	Formation	Thickness	Characteristics	Remarks
Tertiary	Wasatch	?	Gray, red, green and purple sandy clays; brown and gray shales and soft, massive sandstones; massive, cross-bedded sandstone near the base, locally conglomeratic.	Contains oil in the lower massive sandstone.
			Unconformity	
	Fort Union	3200 to 3400	Gray and brown sandstones and shales; massive, cross-bedded sandstone and conglomerate at the base.	Contains numerous beds of coal.
Cretaceous	Laramie	3500 to 3800	Gray, buff and brown concretionary sandstone; gray, brown and black shales.	Coal-bearing.
	Lewis Shale	1500	Dark shales with several thin sandstone beds.	
	Mesaverde	?	Gray and brown shales and sandstones.	



MAP OF WYOMING, SHOWING AREA DISCUSSED IN THIS BULLETIN
For information regarding the Douglas Field see Bulletin 3A, Series B.

Mesaverde Formation. The upper portion of this formation is composed of gray and brown shales and thin-bedded sandstones, with several beds of massive sandstone near the top. The lower portion of the formation was not examined. The formation is believed to be coal bearing.

Lewis Shale. The Lewis shale is composed, in the greater part, of soft, gray to black, sandy shales, with a number of beds of shaly sandstone near the top of the formation. The shale weathers more rapidly than the Mesaverde and Laramie formations and produces a series of valleys between the highlands of those formations.

Laramie Formation. Overlying the Lewis shale is a series of gray, buff, and brown sandstones, and gray, brown, and black shales of Laramie age. In the upper portion of the formation are several beds of massive sandstone, some of which are concretionary, but as a rule the sandstones are thin-bedded. At the base of the formation is a bed of massive, gray to buff sandstone which forms a prominent hogback. The formation is believed to be coal bearing throughout.

Fort Union Formation. At the base of the Fort Union formation is a bed of very massive, cross-bedded sandstone, at some points conglomeratic. Overlying the basal sandstone are buff and brown sandstones and gray and brown shales, with several coal beds. Overlying this member is a non coal-bearing member, consisting principally of sandy clay, with a few beds of soft, slabby sandstone. The formation is not exposed in its entire thickness, being concealed in part by the overlying Wasatch beds.

Wasatch Formation. In the region under consideration the Wasatch is separated from the Fort Union formation by a pronounced unconformity, and rests on the middle member of that formation. In the vicinity of the oil field the upper member of the Fort Union is concealed by the overlap, though the beds which form its upper part are exposed some 15 miles north. At the base of the Wasatch formation are beds of sandy clay, overlain by a massive, coarse-grained sandstone, which was thoroughly saturated with oil at all points where its outcrop was found. This sandstone contains, locally, lenses of conglomerate of two varieties; one of which is made up of pebbles of fine-grained, gray, shaly sandstone, the pebbles ranging up to six inches in their longest diameter. The other conglomerate is finer grained, and is composed of pebbles of chert and grains of quartz, the largest of which are not more than one-half inch in diameter. Above the basal sandstone the formation consists chiefly of sandy clay, with a few beds of shale and soft massive sandstone. The clays are red, white, green, and maroon in color, while the sandstones are gray and brown. The Wasatch formation extends from Muddy Creek westward beyond the western limits of the area under discussion.

OIL. The presence of oil in the Muddy Creek field is indicated by the presence of oil-saturated sandstone which outcrops at many points, notably in sections 3, 10, and 15, Township 17 north, Range 92 west, and in section 34, Township 18 north, Range 92 west. At Cedar Butte, in the northwest quarter of section 10, Township 17 north, Range 92 west, the oil sand is exposed in its entire thickness—28 feet—while at other points only the lower portion of the oil sandstone is exposed. So thoroughly saturated with oil is the lower portion of this sandstone that it was used as fuel by the writer during the course of the examination.

Development in the field is confined to the well drilled by the Larsen Oil Company on section 10. This well was located east of the outcrop of oil-bearing sandstone, the stratum dipping west, and there was, therefore, no possibility of obtaining oil from the known oil-bearing stratum.

On Cow Creek, in section 27, Township 16, Range 91, gas is escaping in the bed of the stream, and in several springs which occur near the base of the Lewis shale. A rather large spring, 25 feet or more in diameter, situated in the north half of the section, is kept in a state of constant ebullition by the escape of gas. The presence of gas along Cow Creek led to the drilling of a well, some two or three years ago, near the junction of Cow and Deep Creeks. The well was measured by the writer and the bottom reached at 75 feet, though it is probable that it had caved and filled to some extent. A small amount of water is now flowing from the well, while sufficient gas is escaping to burn with a flame ten inches in length. The gas is odorless and colorless and burns with a yellow flame. It is believed by the writer to be marsh gas, and is not thought to indicate in any way the presence of either oil or gas in commercial quantities.

The following analyses of the oil from the Muddy Creek field were furnished by

Mr. H. Larsen of Rawlins, who obtained a small quantity of oil by distillation of the saturated sandstone:

Von Schultz & Low, Denver, Analysts

Distillation of oil

Below 150 degrees C.	0.00 per cent.	Benzine, naphtha, gasoline
150 to 200 degrees C.	4.60 per cent.	Kerosene
200 to 250 degrees C.	18.60 per cent.	High-grade kerosene
250 to 300 degrees C.	53.50 per cent.	Headlight oil
Above 300 degrees C.	11.70 per cent.	High-grade lubricating oil
Residue	11.60 per cent.	Coke

Percentage of oil in rock, 9.70.

The above analysis apparently shows entirely too large percentages of illuminating oils.

Analysis of Oil by N. F. Harriman, Chemist and Engineer of Tests, U. P. R. R. Omaha

Percentage of oil in rock, 8.41

Distills between 420 degrees F. and 700 degrees F.

Oil is of asphaltum base.

Future Development. In the future, development should be confined to that portion of the district which lies west of the oil sandstone outcrop. The first wells should be drilled on sections 4, 5, 8, or 17, Township 17 north, Range 92 west, where the oil-bearing sandstone can be reached at depths ranging from 600 to 1,000 feet. In no case should the non-success of a single well be considered as conclusive evidence, as there are few oil fields where there are not dry holes, even near productive wells. It is not probable that flowing wells will be obtained in this field, but the conditons are such that highly productive pumping wells may be brought in at depths ranging from 600 to 2,500 feet.

WATER SUPPLY. The streams that traverse this region are intermittent, but water sufficient for drilling purposes may be obtained from shallow wells sunk in the alluvium of the valleys. The water of Muddy Creek carries a large amount of solid matter in suspension, and is alkaline, but it was used in the boiler operated by the Larsen Oil Company with no bad results. For domestic purposes it requires settling, or, preferably, filtration.

COAL. Coal beds are numerous in the Laramie and Fort Union formations, the workable beds ranging in thickness from three feet to fifteen feet. Near old Washakie stage station, in section 8, Township 17 north, Range 91 west, is an opening made in 1870 by the Overland Stage Company. This opening was cleaned and retimbered by the Larsen Oil Company, and the coal used under the company's boilers. The vein was found to be nine feet in thickness and the coal of good quality. In section 3, Township 16 north, Range 92 west, is the Corlett opening, about 35 feet in depth. Aside from these openings, coal sufficient for drilling operations can be obtained at many points in the district at but slight expense.