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The Salt Creek Oil Field

Natrona County

BY

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INTRODUCTION

Owing to the continued heavy demand for information regarding the Salt Creek Oil Field, the edition of Bulletin No. 4, Series B, of the State Geologist's office, written by Mr. C. E. Jamison, has been completely exhausted. It was, at first, intended to reprint that bulletin *in toto*, but after gathering up data of recent development, the writer decided to rewrite the pamphlet, using parts as originally printed, also quoting sections from the U. S. G. S. report, made by Mr. C. H. Wegemann, in 1911, and adding such information as has become available since the original Bulletin No. 4 was written, in 1912. No additional field work has been done. The maps used are reproductions of, or compilations from, the maps of the earlier reports. An additional map, showing ownership and area of the federal segregation, is also given in this issue. Some technical geology, lists of fossils, etc., have been omitted from this issue. Anyone who wishes to study such, has access to the earlier reports filed with libraries and educational institutions. To cut down the cost of printing, the illustrations have also been omitted.

Acknowledgment is gladly made to Mr. Wegemann of the U. S. G. S. and to Mr. Jamison for the portions of their reports reproduced, and our thanks are extended to the various operating companies for their assistance in bringing the well records up to date. To Mr. Wilson of the Midwest and Mr. Waltman of the Franco especial thanks are due.

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State Geologist.

CHEYENNE, WYO., March 30, 1914

CONTENTS

The Salt Creek Oil Field

LOCATION

The area known as the Salt Creek Oil Field comprises parts of townships 39, 40, and 41 North, ranges 78, 79 and 80 West. Between 106° 10′ and 106° 30′ west longitude, and 43° 20′ and 43° 30′ north latitude, in the northeastern corner of Natrona County. Salt Creek Postoffice, near the center of the field, is forty-five miles north of Casper, by wagon road.

Casper, with a population of about 4,000, is the supply point for the district. It is a division point on both the Chicago and Northwestern and the Burlington. Besides the oil lines and refineries, Casper is well provided with banks, hotels, newspapers, and general merchandise and oil well supply houses. It is the county seat of Natrona County, and the largest town in central Wyoming.

TOPOGRAPHY

The topography of the Salt Creek Oil Field is a splendid illustration of how structural geology expresses itself on the surface of the earth. As, structurally, the Salt Creek dome is almost ideal, so we find the surface appearance to conform with our expectations of what the structure would produce.

The central area, an anticlinal valley, is wholly within the Pierre shales, and the sharp steep water courses, with the rather bare, treeless, rounded hills between drainage lines, are all typical of badland erosion surfaces of the Pierre. While in dry weather one may drive almost anywhere, in any direction, over the Pierre surfaces, in wet weather every slope is a slippery, clayey, dangerous toboggan slide.

Surrounding the central Pierre area, is the scarp of the Shannon sandstone, dipping away in every direction, and back of it and in parallel lines are outcrops of the succeeding shales and sandstones, rising in ever increasing altitude to the highest pine-clad scarp of the Pine Ridge Sandstone.

One may secure, at one view, the panorama of the whole field from the top of one of these high outer scarps. The basin lies below, showing its geologic structure as plainly as it is possible for nature to show anything. The pictures of a textbook are hardly more easily read.

HISTORY OF DEVELOPMENT

Although the oil springs in section 13, township 40 north, range 79 west, were known in the early 80's, no development was attempted until November, 1889, when M. P. Shannon of Pennsylvania began drilling in section 36, T. 41 N., R. 79 W. The well was completed in August, 1890, at a depth of 1030 feet, yielding four barrels of oil per day. Since 1895 this well has been pumped almost continuously with but little, if any, variation in production. In the two years following the completion of the first well three more wells were drilled, the oil was hauled to the railroad and marketed, from $6.00 to $8.00 per barrel being obtained. In 1895 the Pennsylvania Oil & Gas Company, organized by Shannon, erected a small refinery at Casper, and before the end of 1902 thirteen wells had been drilled. The product of these wells is a rather heavy oil of paraffin base, chiefly valuable for lubricating purposes. The Pennsylvania Oil & Gas Company sold its holdings to Jos. H. Lobell of Chicago in 1905, who in turn sold to various foreign companies, among them being the Ascos Company, the Petroleum Maatschappij Salt Creek, and the Franco-Wyoming Oil Company.

Prior to 1906 the central portion of the field, the portion now known as the Salt Creek dome, had received but little attention. The lands had been located as placer claims but no discoveries of oil had been made. In 1906 Dr. Caesare Porro, an eminent Italian geologist, visited the field

and made a report to the Petroleum Maatschappij, or "Dutch" company. Dr. Porro located a point for drilling a well in the central portion of the dome. In 1908 a well was drilled at the point indicated by Dr. Porro, the sand was struck at a depth of 1175 feet, and the well was completed at 1190 feet. This well, which was a "gusher", produced 600 barrels of oil per day when brought in, the present production being 150 barrels.

Before the Porro well was drilled J. E. Stock drilled a well in section 22, T. 40 N., R. 79 W., obtaining oil in the shale at shallow depth. Although this well did not reach the sand it indicated the possibility of obtaining oil in the shales near the surface, and the various companies began drilling two-inch holes with spring poles. Oil was obtained in nearly all these holes at depths ranging from 30 to 100 feet, and the locations were thus perfected.

In 1907 the Stock Oil Company was formed and drilled in the northeast quarter of section 25, T. 40 N., R. 79 W., while Fitzhugh & Henshaw of California and the Midwest Oil Company entered the field in 1910. In 1911 the Ascos Company, the Franco-Wyoming Company and the "Dutch" Company were merged to form the Wyoming Oil Fields Company, and the Stock Oil Company and the Fitzhugh & Henshaw holdings were absorbed by the Midwest Company. During the same year refineries were built at Casper and pipe lines laid to the field by the Midwest Company and the Natrona Pipe Line and Refinery Company, the latter being a subsidiary of the Wyoming Oil Fields Company. Since 1910 development has been rapidly carried on and there are now more than 100 producing wells in the field. Early in 1914 the Midwest Oil Co. and the Franco Petroleum Co. consolidated, forming the Midwest Refining Co., capital $20,000,000, bringing practically the whole field into one organization.

A large area which had been classified as mineral land was withdrawn from entry of all kinds in 1909. Upon re-classification all lands except those mentioned below were restored to entry, June 25, 1910. The withdrawal of these lands has resulted in a large amount of litigation and has greatly retarded the development of the field.

LANDS WITHDRAWN FROM ENTRY
Shown on Plate 6 attached.

Township 40 North, Range 78 West:
Section 6: Lots 4, 5, 6, 7; SE¼ of SW¼;
Section 7: Lots 1, 2, 3, 4; E½ of W½; SW¼ of SE¼;
Section 18: Lots 1, 2, 3, 4; W½ of E½; E½ of W½; SE¼ of SE¼;
Section 19: All;
Section 20: SW¼ of NW¼; W½ of SW¼;
Section 29: W½ of NW¼; SW¼; SW¼ of SE¼;
Sections 30 and 31: All;
Section 32: W½ of NE¼; SE¼ of NE¼; W½; SE¼;
Section 33: SW¼ of SW¼;

Township 40 North, Range 79 West:
Section 1: All;
Section 2: S½ of NE¼; W½; SE¼;
Section 3: E½; E½ of W½;
Sections 10 to 15 inclusive All;
Sections 22 to 27 inclusive: All;
Section 28: SE¼ of NE¼; E½ of SE¼;
Section 33: E½; E½ of SW¼;
Sections 34, 35 and 36: All.

Township 39 North, Range 78 West:
Section 4.: W½ of W½;
Sections 5 to 8 inclusive: All;
Section 9: W½ of W½;
Section 16: W½; SW¼ of SE¼;
Sections 17 to 21 inclusive: All;
Section 22: SW¼ of NW¼; SW¼;
Section 27: W½ of NE¼; W½; SE¼;
Section 29: N½; N½ of SW¼; SE¼ of SW¼; SE¼;
Section 30: Lot 1; NE¼; E½ of NW¼; NE¼ of SE¼;
Section 32: N½ of NE¼; SE¼ of NE¼;
Section 33: N½; N½ of SW¼; SE¼ of SW¼; SE¼;
Section 34: All;
Section 35: SW¼ of NW¼; W½ of SW¼; W½ of SW¼; SE¼ of SW¼
Section 35: SW¼of NW¼; W½ of SW¼; SE¼ of SW¼;

Township 39 North, Range 79 West:
Sections 1, 2, and 3: All;
Section 4: E½ of NW¼; NE¼ of SW¼; E½;
Section 9: N½ of NE¼; SE¼ of NE¼;
Section 10: N½; N½ of SW¼; SE¼ of SW¼; SE¼;
Sections 11, 12 and 13: All;
Section 14: N½; N½ of SW¼; SE¼ of SW¼; SE¼;
Section 15: N½ of NE¼; SE¼ of NE¼;
Section 23: N½ of NE¼; SE¼ of NE¼;
Section 24: N½; N½ of SW¼; SE¼ of SW¼; SE¼;
Section 25: NE¼ of NE¼.

Township 38 North, Range 78 West:
Section 2: SW¼ of NE¼; W½; W½ of SE¼;
Section 3: All;
Section 4: Lots 1, 2, 3; S½ of NE¼; N½ of SE¼; SE¼ of SE¼;
Section 9: E½ of NE¼; NE¼ of SE¼;
Section 10: All;
Section 11: W½ of NE¼; W½; SE¼;
Section 14: All;
Section 15: N½; N½ of SW¼; SE¼ of SW¼; SE¼;
Section 22: NE¼; NE¼ of NW¼; E½ of SE¼;
Section 23: All;
Section 26: NW¼ of NE¼; N½ of NW¼.

GEOLOGY

Table of rock formations, character, and thickness.

TERTIARY				
UPPER CRETACEOUS	Montana 5000 feet	Pierre 4340 feet	Fox Hills. White sandstone and shales. Marine.	700?
			Shale and sandstone. Little Pine Ridge.	1000
			Parkman Sandstone.	350
			Shale with sandstone 250 feet above base. Marine.	1100
			Shannon Sandstone. Oil-bearing. Marine	175
			Gray shale. Marine.	1025
	Colorado 2675 feet		Niobrara Shale. Light-colored, sandy. Marine.	735
		Benton 1670 feet	Dark shale. Marine.	220
			Wall Creek Sandstone. Buff sandstone, cross-bedded. Marine shells, fish teeth and fragments of petrified wood. The productive sand of the Salt Creek Field.	120
			Dark shale. Marine. Several non-continuous sandstones.	760
			Mowry Shales. Hard slaty shale with fish scales. Usually forms hogbacks and weathers light-colored.	300
			Dark shale with one thin sandstone.	270
			Dakota (?) sandstone. Fresh water.	56
			Morrison	

STRATIGRAPHY*

The rocks to be directly considered in a study of the Salt Creek oil field belong to the upper part of the Cretaceous system of the Mesozoic, which is known as Upper Cretaceous series.

*This chapter is taken direct and *in toto* from The Salt Creek Oil Field, Wegemann, U. S. G. S. Bulletin, 452.

Dakota (?) Sandstone

The lowest Upper Cretaceous formation in this region, according to the usual classification, is the sandstone called the Dakota, which here rests upon the variegated shale of the Morrison formation. By some authors, however, the Morrison is placed in the Cretaceous System*. Its sandstones bear oil, but in doubtful quantity.

The sandstone here called the Dakota may or may not be the Dakota. It occupies the same stratigraphic position as the formation described by Darton* as the Cloverly, which is supposed by him to represent the Lakota, Fuson and Dakota of the Black Hills, or, in other words, to represent the later Lower Cretaceous deposits and the earliest Upper Cretaceous deposits. Fisher† correlates the Cloverly formation of the Big Horn of Wyoming with the Kootenai of Montana and believes it to be of Lower Cretaceous age.

The Dakota sandstone does not outcrop in the Salt Creek field, although it doubtless underlies it. Some 20 miles west of the field it is brought to the surface in the Powder River dome, where it is composed of 55 feet of conglomeratic cross-bedded oil-stained sandstone. At its base in many localities there is a thin coal bed and particles of coal occur throughout the conglomerate. The only fossils found in the formation are the impressions of small leaves and these are by no means numerous. In the Powder River field the Dakota is a definite sandstone unit, but in areas farther north it is not so well defined. The sandstone is not conglomeratic and is interbedded with shale. Its exposures in this area have been described by N. H. Darton, under the name of Cloverly.

Colorado Group

Benton Shale.—Upon the Dakota (?) sandstone, in apparent conformity, lies the Benton shale, 1,700 feet thick, containing sandstone beds and, in its lower part,

*Darton, N. H., Geology of the Big Horn Mountains, Prof. Paper U. S. Geol. Survey, No. 51, 1906.

†Fisher, C. A., Southern extension of the Kootenai and Montana coal-bearing formation in northern Montana: Econ. Geology, Vol. 3, No. 1.

the cliff-forming fish-scale known as the Mowry silicious shale member. The lowest of the sandstone beds occurs 80 feet above the top of the Dakota sandstone. It is 14 feet thick, the lower part consisting of thin bedded sandstone and shale, the top layers of firm sandstone, strongly ripple marked. This sandstone bed, though comparatively thin, is found throughout a considerable area in this region. It usually forms a marked plateau or terrace.

About 70 feet above the sandstone just described is a thin sandstone bed at the base of the Mowry. In some places this bed forms a conspicuous white ledge, in others it dies out almost entirely. At its base is a horizon represented by carbonaceous shale or petrified wood, and in one locality by a thin bed of coal. The Mowry shale member, 300 feet in thickness, is a phase of the Benton which is easily recognized. Its outcrop almost always forms a prominent ridge. The shale weathers white and on examination shows great numbers of fish scales. At its top occurs a 5-foot bed of bentonite (a hydrous silicate of alumina), which forms a conspicuous white band in the slopes and in wet weather becomes so exceedingly slippery that it is dangerous to cross on horseback. Above the Mowry are 800 feet of sandstone and shale. The sandstone occurs in several beds which change considerably in character from place to place. At some places one is conspicuous, at others another. Usually, however, at least one of these beds forms marked cliffs in the interval between the top of the Mowry and the base of the oil-bearing sand of the Benton, to which the name Wall Creek sandstone lentil is here given.

The Wall Creek sandstone lentil, like the other rocks thus far described, is not exposed in the Salt Creek field. It reaches the surface in an escarpment 12 miles west of Salt Creek which rims the Powder River dome much as the Shannon sandstone lentil rims the Salt Creek dome. It forms the lofty escarpment around the Powder River dome, known locally as "The Wall", and is best exposed above Wall Creek, a little stream named from it.

Along Wall Creek the sandstone is between 80 and 100 feet in thickness, but in the Salt Creek dome thicknesses

as great as 150 feet are reported in some of the wells. The sandstone is buff in color, firmly cemented, and of medium grain. Cross bedding and ripple marks are common. It contains numerous fossils, prominent among which are *Prionocyclus wyomingensis* and species of *Inoceramus*. Fossil wood showing worm borings is present in many places. The Wall Creek sandstone lentil is overlain by shale.

Niobrara Shale.—About 220 feet above the top of the Wall Creek sandstone, the dark shale of the Benton gives place to sandy shale, buff or bluish gray in color, of Niobrara age. It contains fragments of very thick-shelled *Inoceramus*, to which are attached in clusters numerous *Ostrea congesta*, a small oyster. The association of these two fossils is typical of this formation. Exposures of the Niobrara shale are usually concealed in a broad valley, and the limits of the formation are somewhat difficult to establish and trace. The lower limit, as already mentioned, is placed a little over 200 feet above the top of the Wall Creek sandstone lentil. At this point the shale changes abruptly from dark to light in color and is somewhat more sandy in composition. At this point also *Ostrea congesta* appear in considerable numbers; below it only isolated specimens can be found.

At the top of the formation are two or three beds of limestone only a few inches in thickness. *Ostrea congesta* are fairly abundant in the shale below these beds of limestone, but above them none could be found. At several places large *Baculites* distinctive of the Montana group were found a short distance above these limestone beds. At the limestone horizon, also, there is a slight change in lithologic character of the shale. Above the limestones there are numerous very thin beds of reddish calcareous shale, whereas below none is found. The peculiar structure known as "cone in cone" is also common above the limestones, but does not occur in the Niobrara. The amount of alkali in the Montana group is apparently greater than in the Niobrara shale, as indicated by the white alkali deposited on the surface by evaporation. These differences, although perhaps unimportant in themselves, furnish a convenient

means of separating the Niobrara from the overlying Montana where fossils cannot be found.

Owing to the lack of exposures the thickness of the Niobrara shale is difficult to determine. Three sections made along the outcrop from 1 to 4 miles northwest of Kaycee gave an average of 735 feet. Another section at the southeast of the Powder River dome, about 4 miles southwest of Scott's ranch, gives a thickness of 1,025 feet, which is unusually great. Exposures in this locality are good and there seems to be little chance of error unless concealed faults have duplicated the beds. Even if this section is disregarded, however, it is evident that the Niobrara in this general region is of unusual thickness as compared with other localities although much less distinct in lithologic character.

Montana Group

Pierre Formation.—Above the Niobrara shale the gray shale of the Pierre extends uninterruptedly for 1,000 feet. It weathers into "adobe hills" producing a type of topography that is monotonous and uninteresting. As stated above, the shale contains numerous thin beds of firmer calcareous shale stained red by oxide of iron. At a few places lenses of other material occur. In T. 40 N., R. 79 W., a peculiar conglomerate was observed about 375 feet above the base of the Pierre. It is for the most part brick red in color, but contains a few black, well-rounded pebbles and numerous fish teeth. The bed is not over two feet thick and can be traced for only a mile along its outcrop. In section 14 in the same township is a thin red sandstone containing dark pebbles. A bone of a swimming saurian was found on its surface. The bed is small in extent and lies about 200 feet stratigraphically above the fish-tooth conglomerate just described. These sandstones are evidently lenses in the shale. The principal fossils in this portion of the Pierre are large *Baculites*, but even these are not numerous.

Upon the shale just described lies a sandstone which forms the rim rock of the Salt Creek dome. South of Shannon this sandstone has a thickness of 170 feet. It is some-

what variable in character, but usually contains two resistant beds, about 100 feet apart, and an intermediate mass of softer sandstone, It is here named the Shannon sandstone lentil. The heavy lubricating oil of the Shannon field occurs near the base of this sandstone.

Above the Shannon sandstone lentil is 1,100 feet of shale, with a 30-foot bed of sandstone, locally occurring 225 feet above its base. About 100 feet below the top of this shale are marine Montana fossils. Here also was found a vertebral centrum doubtfully determined as Mosasaurus.

Above the shale just described occurs a series of beds of sandstone, coal and shale, about 300 feet thick, which bears a fauna similar to that found in the upper Clagget of Montana, the Parkman sandstone of Wyoming, and the Mesaverde formation of Colorado. The name Parkman is adopted in this report, since this name has been used by Darton for the sandstone as it outcrops along the flank of the Bighorn uplift.

At the base of the Parkman sandstone member is about 40 feet of shaly sandstone, and above this a massive white to buff sandstone, 100 feet thick, which shows much cross-bedding. Its outcrop forms a striking escarpment. Almost at the base of this striking sandstone near Shannon, R. W. Stone collected fossils which were identified by Dr. Stanton. Large bones have also been found imbedded in the sandstone. The writer measured one which was 6 inches in diameter and 2 feet 6 inches long in its exposed portion. The entire bone was considerably longer. It was identified by C. W. Gilmore as the distal half of a femur of an animal belonging to the genus *Trachodon*. Turtle shell was found in association with it.

A group of thin coal beds, dark shale and white sandstone, the whole 125 feet thick, increases the height of the sandstone escarpment or forms a second escarpment outside of it. These beds apparently represent alternating brackish water and fresh-water conditions. Some of the strata contain considerable iron, which gives them a brownish cast. The contrast in colors—white, black, brown or gray—between the numerous thin beds of this group is striking. The coal beds are less than 14 inches thick in

this field. They occur at the same horizon as those mined 50 miles farther south near Casper. (Coal "B", Shaw's map.*)

Near the top of the fresh-water beds just described is a white sandstone, 10 to 40 feet thick and above it in certain localities is a thin calcareous layer in which are imbedded fragments of dinosaur bones, among which a caudal vertebra of *Trachodon* was identified. At this horizon, in the SW. ¼ SE. ¼ sec. 23, T. 41 N., R. 79 W., a dermal scute of an ancient crocodile was obtained, but no other bones were found in the vicinity. Only one other specimen of this crocodile has been found and that occurred in the Judith River formation of Montana. It was described and named by Dr. W. J. Holland as *Deinosuchus hatcheri*, and is estimated to have been from 35 to 40 feet in length.†

About 30 feet above the dinosaur horizon invertebrate fossils were collected, of which Dr. T. W. Stanton says:

> "They belong to a phase of the Montana fauna very similar to that which occurs in the upper Clagget, near Billings, Mont., and the Mesaverda of the Laramie Plains, near Harper, Wyo."

From these marine forms it is evident that salt-water conditions were soon re-established after the deposition of the coal beds. Above the stratum in which these fossils occur soft sandstone alternates with shale for an interval of 325 feet. These strata bear occasional Montana fossils. Overlying them is the sandstone forming Little Pine Ridge, a bluish-white sandstone, 50 feet thick, containing two thin beds of coal, which, like the other coal of this general region, is subbituminous. The sandstone forms a ridge, which by the color of the rock and the occasional pine trees it bears, is easily traced throughout the field southward to the vicinity of Casper and thence eastward for 30 miles along the base of the Laramie Mountains,

*Shaw, E. W., The Glenrock Coal Field, Wyo. Bull. U. S. G. S. No. 341, 1909, p. 154.

†Annals Carnegie Museum, vol. 6.

where it is reported to form a more prominent ridge than the massive sandstone comprising the base of the Parkman. To the north, however, near Kaycee, Little Pine Ridge can scarcely be recognized, although the escarpment of the Parkman sandstone is prominent in this region.

Above the sandstone forming Little Pine Ridge is 600 feet of shale, containing some sandy beds. In these beds a few marine invertebrates were found.

Fox Hills Sandstone.—Upon the shale just mentioned rests a sandstone about 100 feet thick, which is persistent throughout this general region. In some localities it is broken in its middle part by a bed of brown carbonaceous shale 6 feet thick. The sandstone below is brown and weathers characteristically into small knobs and pillars. The sandstone overlying the shale is pure white.

Above this sandstone is 600 feet of alternating sandstone and shale of marine origin. This is capped by a pure white sandstone 100 feet thick, which bears the marine plant *Halymenites* and is overlain by the fresh-water beds of the Lance formation. Associated with sandstone are one or more coal beds, which, for the most part, are but a few inches thick, but which in certain places (as for example, sec. 6, T. 38 N., R. 77 W., and sec. 4, T. 37 N., R. 78 W.,) reach a thickness of 5 feet or more. The lower limit of the Fox Hills sandstone is as yet uncertain and is here placed arbitrarily at the base of the sandstone described in the paragraph above. Further studies may, however, show that this boundary is placed too low in the section and that the name Fox Hills should be applied to the upper part of the sandy series only, instead of to the whole.

Cretaceous or Tertiary System

Lance Formation.—Above the Fox Hills sandstone are 50 feet of transitional beds—shale, sandstone, and thin coal—which are barren of fossils. Above these come the concretionary buff sandstone of the Lance formation (also known as "Ceratops beds" and "somber beds") bearing the bones *Triceratops* and *Trachodon*. The Lance formation is 3,200 feet in thickness and is overlain by the Fort Union

formation, comprising the youngest strata exposed in this region.

Tertiary System (Eocene Series)

Fort Union Formation.—At the base of the Fort Union formation lies approximately 2,000 feet of white shaly sandstone containing here and there red ferruginous beds.

The sandstone in this area forms a prominent pine-covered ridge which can be seen for many miles. Above the sandstone occur one or more coal beds and above them a great series of sandstone and shale for the most part light in color. The whole formation is 4,500 feet in thickness.

STRUCTURE

The structural features of interest in the Salt Creek district are the Salt Creek anticline, with the two domes developed along its axis, the shallow Bothwell syncline, and the eastern limb of the Powder River anticline. The Salt Creek anticline extends in a northwest-southeast direction from a point north of Shannon to, and possibly south of the southeast corner of Township 38 north, Range 78 west. On the eastern side of the fold the dips are gentle, ranging from 5° to 12°, while on the western limb steeper dips occur, varying from 14° to 29°. Along the axis of the anticline two domes have been developed, the northern being known as the Salt Creek Dome, and the southern as the Teapot Dome. The domes are separated by a shallow syncline which lies just north of Teapot Creek where that stream crosses the axis of the anticline.

The Salt Creek Dome is oval in shape, its major axis extending in a general north-south direction, and is outlined by the outcrop of the Shannon sandstone which forms a prominent encircling ridge. At either end of its longer axis the beds pitch gently downward, dips on the northern end ranging from 6° to 8° and on the southern end from 1° to 6°. Although the major axis of the dome is well defined, no definite point can be said to occupy the highest point of the uplift. The top of the dome is apparently flattened,

extending from the southwest quarter of section 23, Township 40 north, Range 79 west, to a point west of the center of section 35.

Faults exist at a number of places around the Salt Creek Dome in the Shannon sandstone, the strike of the faults in general being in an east-west direction and the stratigraphical displacement varying from 6 to 120 feet. In the comparatively hard sandstone they may be readily traced but they are lost soon after passing into the softer shales. It is therefore impossible to say how far such faults may extend or what effect they may have on the oil-bearing sandstones. However, faults in soft strata, such as the shales of the Pierre formation, are usually not of great extent, and it is probable that the Wall Creek sandstone is but little affected by the many faults which appear in the Shannon sandstone.

West of the Salt Creek Dome the strata dip rather steeply, rising again, about two miles west of the center of the dome, to form the long slope of the eastern limb of the Powder River anticline. Between the western limb of the Salt Creek Dome and the eastern limb of the Powder River anticline is a shallow trough, called by Wegemann* the Bothwell syncline, whose surface is occupied by shales of the middle portion of the Pierre formation. The eastern limb of the Powder River anticline dips gently eastward to the Bothwell syncline, dips ranging from two to seven degrees.

South of the Salt Creek Dome, on the Salt Creek anticline, is the Teapot Dome, similar to, though somewhat smaller than, the Salt Creek Dome. The eastern, western, and southern sides of the Teapot Dome are outlined by the outcrop of the Parkman sandstone. North of its center it is divided into two smaller domes by a shallow east-west trough. No development has as yet been undertaken in the Teapot Dome. The NW.-SE. Section (Plate 7) shows how relatively small and unimportant the Teapot Dome is in comparison to the Salt Creek Dome. Its oil

*Wegemann, C. H. The Salt Creek Oil Field, U. S. Geol. Survey Bulletin No. 452.

capacity must of necessity be small, but the structure is right for the accumulation of oil to that capacity.

THE SANDS

The highest oil bearing sandstone is the Shannon (Pierre), one hundred and seventy feet thick, which has been eroded from the crown of the dome, leaving an escarpment or "hogback" surrounding the central shale area of all sides. This sandstone at the northern end of the field, at the town of Shannon, has enough oil of low gravity in it to make it of economic value. The amount of oil to be obtained from it is, however, of little importance compared with that of the lower sands.

The Wall Creek sandstone (Benton) lies 2,000 feet below the Shannon. This is 120 feet in average thickness and is the present producing sand of the Salt Creek Dome. As no wells have been drilled to the two lower sands, one 30 feet thick, 250 feet below the Wall Creek and the other 85 feet thick, 560 below it, it is not known whether they are oil bearing or not. The writer is of the opinion that they will be found to contain oil.

The area under which the Wall Creek sand is oil bearing is shown on plate 6. This line may best be described as the line of division between water and oil, the sandstone at points outside and below being water-bearing and on the inside, or above, oil-bearing.

That this line is so far (800 feet) above the sandstone in the syncline to the west is somewhat of a surprise. It must be remembered, however, that erosion has cut so far into the dome that oil was wasting away through springs. The crest of the dome was probably at one time gas filled and the gas naturally escaped before the oil did. Also, the field has numerous small faults which have allowed the oil to migrate into sandy portions of the shales and even into the overlying sandstone. With these losses the oil pool must have shrunk in extent from what it was at one time. That the underlying sands have suffered comparable losses is not probable. If, then, the lower sands are

found to be oil-bearing at all, we may reasonably expect that their productive area will be much larger. As they are thinner sands, they will be more quickly exhausted, i. e., will not have as great storage capacity per acre.

OIL SEEPS

Samuel Aughey in the territorial geologist report for 1886 says on page 81:

> "The largest oil flow is on the southwest quarter of Section 13, Township 40, north of Range 79 west. The oil comes up vertically from beneath on the edge, and some of it from the bottom of Salt Creek, at a point where a bank twenty-five feet high on the north side constitutes the shore line. When I last visited this spring in May, 1884, not less than twenty barrels of oil had accumulated in the creek bed. The rise of the creek from a rainfall one night washed it away, but it immediately commenced again to accumulate, and in less than a week the original quantity was stored. At that time the amount of flow was estimated at one barrel per day. Some distance from the west side of the creek, and in a northerly direction from the above spring, on the west half of Section 12, two other escapes close together occur. All these oil flows come from the Fort Benton shales, the petroleum coming up directly from below."

Wegemann notes several springs as follows:

> "In the Salt Creek fields indications of a lower oil-bearing sand than the one reached by the Shannon wells are given by numerous oil seeps occurring within the encircling outcrop of the Shannon sandstone. Important among these is the Iba spring, which occurs in the S. W. ¼ Section 13, T. 40 N., R. 79 W., in the bed of Salt Creek.
>
> Another seep in the bed of Salt Creek occurs in the S. W. ¼ N. W. ¼ Section 25, T. 40 N., R. 79 W.,

just north of the mouth of a draw which comes in from the southwest. Bubbles of gas may be seen rising at intervals through the water and spreading an oily film on the surface.

On Castle Creek, a little above its junction with Salt Creek in the S. W. ¼ Section 25, T. 40 N., R. 79 W., sand and gravel along the stream bed is saturated with oil which may rise from below. It is not a definite oil-bearing stratum.

It is reported that the Dutch No. 1 well was located beside a large oil seep that is now concealed by the oil reservoir south of the well."

Now that the district is so thoroughly drilled and so much waste oil has been allowed to flow over the surface and into the creeks, it is impossible to find any of the original seeps. As these seeps were inside the Shannon scarps and came up through the shales, it was evident that the oil came from some sandstone reservoir lower than the Shannon.

One wonders that the center of the dome was not drilled long before it was. Every geologist who saw the field was of the opinion that a lower oil sand would be tapped by drilling in the center of the shale area. Both Aughey* and Knight† had made the statement in published articles years before, and even after the private report of Dr. Caesare Porro, the Italian petroleum geologist, the operators waited another two years before drilling the dome.

ORIGIN OF THE OIL

The source of the oil in the shales and in the Shannon sand is an unsettled question. The similar analyses of the Shale and Wall Creek oils seem to point to a common origin, and the probable migration through faults. The Shannon oil is also the equivalent of a Wall Creek oil from which the lighter oils have escaped. It is, however, stated

*Aughey, Territorial Geological Report 1886.

†Knight, University of Wyoming Petroleum Series, Bulletin No. 1.

that a small amount of asphalt has been found in the Shannon oil, while the Wall Creek is without asphalt.

The wells finding oil in the shales usually find it in a narrow stratum of sandy shale or below a rib of very hard dense shale which has acted as an impervious capping. The fact that oil has been found west of the dome at an altitude less than the water-oil dividing line in the dome seems to argue that it has not migrated from the Wall Creek sand, but is entrapped by local conditions near its place of origin, which, in that case, is probably the shales just above the Wall Creek sand. The shales both above and below the Shannon and in fact on down to the Dakota below, were possibly all oil producing and any sand throughout this range saturated. As the shales were deposited under similar conditions the oil would naturally be about the same throughout. The writer does not believe that the oil originated in or below the Dakota. Dakota oil seems to be a practically extinct myth. Where Dakota sand outcrops show oil seepage and stain, it is probably due to oil having migrated to it from some other horizon. As the seepages are asphaltic, the supposition is that the oil has come from the asphaltic oil-bearing Embar, or other Carboniferous strata below. The Benton oils are paraffine oils throughout the State and probably originate in the Mowry shale beds and adjoining strata of the lower Benton.

ANALYSES OF SALT CREEK OILS

	Spec. Grav. at 60° F.	Baume	% to 150°	% 150° to 300°	Analyst or Reference
Shannon	.9091	24.0°			Dr. F. Salathe
Shannon	.9097	23.9		12.5	U. S. G. S. Bull. 452, page 80
Shannon	.9085	24.1		10.	U. S. G. S. Bull. 452, page 80
Shale Well, shale	.83445	37.7	16.	33.	F. E. Koch
Well Sec. 25, 1232 ft. deep shale		39.1			F. E. Koch
Well Sec. 32, 980 ft. deep shale		38.2			F. E. Koch
Well Sec. 23, 135 feet deep shale		38.1			F. E. Koch
Well Sec. 25	.82668	39.3	18.	32.	Dr. F. Salathe
Iba Well, Sec. 22	.8314	38.4	11.	34.	U. S. G. S. Bull. 452, page 80
Stock Well, Sec. 25	.8563	33.5	1.	36.	U. S. G. S. Bull. 452, page 80
Dutch Well No. 1	.8221	40.3	8.	38.	U. S. G. S. Bull. 452, page 80

ANALYSES OF OILS OF VARIOUS OTHER FIELDS

Glenn Pool, Oklahoma	.8459	35.5	8.5	42.	U. S. G. S. Bull. No. 452, page 80
Robinson Pool, Illinois	.846	35.5	8.	39.	U. S. G. S. Bull. No. 452, page 80
McFarland Pool, West Virginia	.8005	44.9	16.	39.	U. S. G. S. Bull. No. 452, page 80
Florence Field, Colorado	.8750	30.	1.5	27.	U. S. G. S. Min. Res. 1908, part 2, page 421 *et seq.*
Independence, Kansas	.8526	34.2	7.	32.5	U. S. G. S. Min. Res. 1908, Part 2, page 421 *et seq.*
Richland, Ohio	.8046	44.	10.	43.	U. S. G. S. Min. Res. 1909, Part 2, page 414 *et seq.*
Spring Valley, Wyoming	.8134	39.5	16.	35.	Bureau of Mines, Bulletin No. 57
Douglas, Wyoming	.8439	35.9	8.	38.5	U. S. G. S. Bull. No. 541-C, page 25
Lander, Wyoming (Plunkett)	.8121	42.4	14.	41.	U. S. G. S. Bull. No. 452, page 29 *et seq.*
Byron, Wyoming	.8315	38.	14.	28.	U. S. G. S. Bull. No. 340, page 355
Cody, Wyoming	.8454	35.6	3.	37.	U. S. G. S. Bull. No. 541-C, page 67

WELLS

In the following pages is given a list of the wells of the field. This is divided into three groups. The first, "Wells in the Wall Creek Sand", contains only those wells which reach into the sand proper. The second group is "Wells of the Shannon District", i. e. wells into the Shannon sand, and the last group, "Shale wells", lists all other wells which found oil in the shales, whether located inside the productive sand area or off several miles to the west.

The list of companies operating in the Salt Creek field is as follows:

Barbados Oil Company
Blackmore Oil Company
Bluestone Oil Company
California Oil Company
Castle Creek Oil Company
Crescent Oil Company
Control Oil Company
Economy Oil Company
Fitzhugh Oil Company
Franco Petroleum Company
Hanley & Bird Oil Company
Henshaw Oil Company
Keystone Oil Company
Lucky Strike Oil Company
Midwest Oil Company
Northwestern Oil Company
Pinero Oil Company
Wyoming Crude Oil Company
Wyoming Pure Oil Company

Wells in Wall Creek Sand

Well No. A-1. Dugout Creek District. Owner unknown. Altitude at top of casing (barometric) 5342 feet. Southwest quarter Section 16, T. 40 N., R. 80 W. Drilled 1895. The record of this well is not available. The well is reported to have passed through the Wall Creek sandstone at about 200 feet depth. A small showing of oil and gas was obtained. The well was continued to a depth of about 1200 feet, where sulphur water was encountered.

Well No. B-1. Hanley and Bradley, owners. Northeast corner of the northeast quarter of Section 3, T. 39 N., R. 79 W. Elevation at top of casing, (barometric) 5033 feet. Depth to Wall Creek sand 1265 feet. Total depth 1330 feet. Neither oil nor water was obtained when the sand was struck. The well was shot with 90 quarts of nitro-glycerine and began to flow at the rate of 1400 barrels per day. Like the other "gusher" wells in the district, it flows during a period of about five minutes and then remains quiescent from twenty to thirty minutes. Drilled 1912.

Well No. E-2. Eclipse Oil Company. Northeast corner of southeast quarter of Section 3. The well is filled with oil to within 290 feet of the surface. Drilled in 1912. Sand was struck at 1455 feet and the well is now being drilled in.

Well No. E-3. Eclipse Oil Company. Southwest quarter of the southwest quarter of Section 12. Elevation at top of casing (barometric) 4956 feet. Water was encountered in the Wall Creek sandstone at a depth of 1900 feet and the well was abandoned.

Well No. E-4. Eclipse Oil Company. Northeast quarter of Section 12. Water was encountered at 1550 feet and the well was abandoned. Drilled in 1912.

Well No. E-6. Eclipse Oil Company. Northwest corner of the northwest quarter of Section 11. Drilling.

Well No. E-7. Eclipse Oil Company. Northeast quarter of Section 9. Drilling.

Well No. E-8. Eclipse Oil Company. Section 27, T. 38 N., R. 81 W. Not shown on map. Drilling.

Well E-9. Eclipse Oil Company. Northwest corner of northwest quarter of Section 12, T. 39 N., R. 79 W. Drilling.

Well No. F-1. Wyoming Oil Fields Company. Northeast corner of southeast quarter of Section 22, T. 40 N., R. 79 W. Elevation at top of casing (barometric) 4958 feet. Depth to Wall Creek sand 1175 feet. Total depth 1205 feet. Initial production 200 barrels. Permanent production 150 barrels. Drilled in 1908. The first well drilled in the Salt Creek District. The well was not drilled into the sand until 1912. November 15, 1913, deepened 14 feet, increased flow to 1200 bbls. per day. Present average production 1100 bbls. per day.

Well No. F-2. Wyoming Oil Fields Company. Southeast quarter of Section 23. Elevation at top of casing 4902 feet. Located by Dr. Porro. The Wall Creek sandstone was reached at a depth of 998 feet, and the well was continued 70 feet into the sand. Although this well produced 500 barrels of oil per day

(estimated) when brought in, its production at the present time is only 60 barrels. It is probable that the oil sand at the point cut by the well, has become clogged with paraffin. The oil is conducted through a two-inch pipe line to a tank about 900 feet distant where its escape causes an intermittent roaring which can be heard a distance of one-fourth mile. The gas which accompanies the oil is conducted from the well to a pool of oil which has accumulated in an adjacent gulch, and is there allowed to escape. The gas causes a constant bubbling, disturbing the surface of the pool and throwing oil spray one to three feet into the air. This was the first "gusher" well to be drilled in the district. Drilled 1908. Cleaned October 20, 1913. Present average production 77 barrels per day.

Well No. F-3. Wyoming Oil Fields Company. Southwest quarter of Section 24. Elevation at top of casing 4884 feet. Depth to oil sand 1080 feet. Total depth 1114 feet. Initial production 200 barrels. Present production 80 barrels. Drilled 1910. Deepened January 19, 1914 through 28 feet more of sand and 9 feet into shale, making total depth 1125. Average daily production now 120 barrels.

Well No. F-4. Wyoming Oil Fields Company. Northeast corner of northeast quarter of Section 26. Elevation at top of casing 4920 feet. Depth to Wall Creek sand 1030 feet. Total depth 1080 feet. Initial production 130 barrels. Drilled 1910.

Well No. F-6. Wyoming Oil Fields Company. Southeast quarter of northwest quarter of Section 26. Elevation at top of casing 4987 feet. Depth to Wall Creek sand 1000 feet. Total depth 1010 feet. Initial production 600 barrels. Present production 320 barrels. Drilled 1910.

Well No. F-7. Wyoming Oil Fields Company. Southwest corner of southwest quarter of Section 18. Elevation at top of casing 4937 feet. This well reached the Wall Creek sand at a depth of 1805 feet, and was continued 21 feet into the sand. The production of the well has never exceeded one barrel per day. If this well was shot it might become a larger producer. Drilled 1910.

Well No. F-13. Wyoming Oil Fields Company. Northeast corner of northeast quarter of Section 23. Total depth 1258 feet. Elevation at top of casing 4901 feet. Initial production 600 barrels. Drilled 1911. Report 1914 daily production 180 barrels.

Well No. F-14. Wyoming Oil Fields Company. Southwest quarter of Section 13. Elevation at top of casing 4851 feet. Total depth 1355 feet. Initial production 550 barrels. Permanent production 200 barrels. Drilled 1911. 1914, 135 barrels.

Well No. F-15. Wyoming Oil Fields Company. Southwest quarter of Section 13. Elevation at top of casing 4840 feet. Drilled on the bank of Salt Creek near the Iba Spring. Although the well is situated 4000 feet west of, and reached the Wall Creek sandstone at a point 400 feet higher than Well No. F-7, it produces five barrels of oil and five barrels of water, while Well No. F-7 produces no water. Less than 1000 feet west of this well are some of the largest producing wells in the field. The log of the well follows:

Commenced drilling November 7th, 1911.
Shale to 1342 feet. Trace of oil in the shale.
Sand with water at 1342 feet. Put in packer at top of sand.
Water sand to 1368 feet. Produces 2 barrels of water per day.
Struck oil at 1368 feet.
Depth of well 1393 feet.
Thickness of sand 51 feet.
Well filled with about 450 feet of oil and 100 feet of water.
Well completed December 11th, 1911. 1914 shut in.

Well No. F-16. Wyoming Oil Fields Company. Northwest quarter of northwest quarter of Section 24. Elevation at top of casing 4869 feet. Depth to Wall Creek sand 1164 feet. Total depth 1204 feet. Initial production 800 barrels. Permanent production 764 barrels. Drilled 1912. 1914, 565 barrels.

Well No. F-17. Wyoming Oil Fields Company. Southeast corner of northwest quarter of Section 23, T. 40 N., R. 78 W. Elevation at top of casing 4906 feet. Depth to Wall Creek sand 1030 feet. Total depth 1100 feet. Initial production 250 barrels. Permanent production 150 barrels. Drilled 1912. 1914, 40 barrels.

Well No. F-18. Wyoming Oil Fields Company. Southwest corner of southwest quarter of Section 13, T. 40 N., R. 79 W. Elevation at top of casing 4866 feet. Initial production 500 barrels. Present production 200 barrels. Drilled 1912. 1914, 158 barrels.

Well No. F-19. Wyoming Oil Fields Company. Northwest corner of southeast quarter of Section 23. Elevation at top of casing 4912 feet. Initial production 350 barrels. Present production 157 barrels. The log of the well follows:

Shale to 1015 feet.
Show of oil at 90 feet.
At 300 feet produced 3 to 4 barrels of oil per day.
Oil sand at 1015 feet.
Bottom of hole at 1115 feet.
Several small pockets of gas were struck while drilling.
Well completed August 30th, 1912.
Cleaned to 1147 foot depth Nov. 1913. Production 100 barrels per day.

Well No. F-20. Wyoming Oil Fields Company. Northwest quarter of southwest quarter of Section 23. Elevation at

top of casing 4958 feet. Depth to Wall Creek sandstone 1022 feet. Total depth 1147 feet. Initial production 250 barrels. Present production 200 barrels. Drilled 1912. 1914, shut in.

Well No. F-61. Southwest quarter Section 13, T. 40 N., R. 79 W. Drilling commenced October 21, 1912. Completed to top of sand (1220 feet) November 28, 1912.

Drilling suspended until December, 1913, when this well was drilled 75 feet into the sand, where it produced very little oil but a large quantity of gas. Well was shot on December 15, 1913, with 180 quarts of nitro-glycerine and at present time has an average daily production of 232 barrels. Total depth, 1295 feet.

Well No. L-1. Lucky Strike Oil Company. Southwest quarter of Section 16, T. 39 N., R. 79 W. This well is reported to be 1835 feet deep. A showing of oil was reported from the Shannon sandstone at a depth of 840 feet.

Well No. M-1. Midwest Oil Company. Northwest quarter of southwest quarter of Section 13, T. 40 N., R. 79 W. Record not available.

Well No. M-2. Midwest Oil Company. Northwest quarter of southwest quarter of Section 13. Elevation at top of casing 4848 feet.

Commenced drilling February 5, 1912.
Shale to 1294 feet.
Oil sand at 1294 feet.
Sand to 1340 feet—bottom of hole.
Well completed March 28th, 1912.

Well No. M-3. Midwest Oil Company. Southwest quarter of Section 13. Elevation at top of casing 4870 feet. Record not available.

Well No. M-4. Midwest Oil Company. Southwest quarter of Section 13. Elevation at top of casing 4854 feet. Depth to sand 1256 feet. Drilled 1912.

Well No. M-5. Midwest Oil Company. Southwest quarter of Section 13. Elevation at top of casing 4849 feet. Depth to Wall Creek sandstone 1251 feet. Total depth 1301 feet. Initial production 2,000 barrels. Present production 1200 barrels.

Well No. M-6. Midwest Oil Company. Southwest quarter of Section 13. Elevation at top of casing 4853 feet. Record not available.

Well No. M-7. Midwest Oil Company. Southwest quarter of southwest quarter of Section 13. Elevation at top of casing 4861 feet. Depth to Wall Creek sandstone 1215 feet. Total depth 1255 feet. Drilled 1911.

Well No. M-8. Midwest Oil Company. Southeast quarter

of southwest quarter of Section 14. Depth to Wall Creek sandstone 1187 feet. Total depth 1207 feet. Initial production 250 barrels. Present production 100 barrels.

Well No. M-9. Midwest Oil Company. Southeast quarter of southeast quarter of Section 14. Depth to Wall Creek sandstone 1207 feet. Total depth 1253 feet. Initial production 200 barrels. Present production 150 barrels.

Well No. M-10. Midwest Oil Company. Northeast quarter of Section 25. Elevation at top of casing 4935 feet. Depth to Wall Creek sand 1166 feet. Oil at 1180 feet. Total depth 1238 feet. Present production 75 barrels. Drilled 1910.

Well No. M-12. Midwest Oil Company. Southwest quarter of northeast quarter of Section 25. Elevation at top of casing 4904 feet. Oil sand at 1193 feet. Total depth 1265 feet. Drilled 1912.

Well No. M-13. Midwest Oil Company. Center of Section 25. Elevation at top of casing 4905 feet. Wall Creek sand at 1151 feet. Oil at 1170 feet. Total depth 1205 feet. Production 75 barrels. Drilled 1910.

Well No. M-14. Midwest Oil Company. Northwest quarter of southeast quarter of Section 25. Elevation at top of casing 4879 feet. Depth to Wall Creek sand 1193 feet. Total depth 1265 feet. Drilled 1912.

Well No. M-15. Midwest Oil Company. Northwest quarter of southeast quarter of Section 25. Elevation at top of casing 4896 feet.

Commenced drilling March 23rd, 1912.
Shale to 1140 feet.
Oil sand at 1140 feet.
Sand to 1243 feet, bottom of hole. Sand was very hard.
Completed well May 4th, 1912.

Well No. M-16. Midwest Oil Company. Southwest quarter of southeast quarter of Section 25. Elevation at top of casing 4912 feet. Depth to sand 1179 feet. Total depth 1305 feet. Drilled 1912.

Well No. M-17. Midwest Oil Company. Southwest quarter of southeast quarter of Section 25. Elevation at top of casing 4921 feet. The log of the well follows:

Commenced drilling May 11th, 1912.
May 17th. Broke shaft. Shut down 7 hours. Depth 820 feet.
May 20th. Broke cable. Shut down 2 hours. Depth 1000 feet.
May 22nd. Struck sand at 1100 feet.
May 28th. Well blew out and had to quit work.
May 29th. Well flowed steadily until 3:00 p. m.
June 2nd. Finished hole at 1218 feet.

Well No. M-18. Midwest Oil Company. Southeast quarter

of southeast quarter of Section 26. Elevation at top of casing 4932 feet. The record of this well is not available.

Well No. M-20. Midwest Oil Company. Northwest quarter of northwest quarter of Section 36. Elevation at top of casing 4938 feet. Depth to sand 995 feet. Total depth 1075 feet. Drilled 1912.

Well No. M-22. Midwest Oil Company. Northwest quarter of northwest quarter of Section 36. Elevation at top of casing 4943 feet. Depth to Wall Creek sand 1120 feet. Total depth 1195 feet. Drilled 1912.

Well No. M-23. Midwest Oil Company. Northwest quarter of northwest quarter of Section 36. Elevation to top of casing, 4951 feet. Depth to Wall Creek sand 1106 feet. Well not yet drilled into sand. Drilled 1912.

Well No. M-24. Midwest Oil Company. Northwest quarter of northwest quarter of Section 36. Elevation at top of casing 4957 feet. Depth to Wall Creek sand 1149 feet. Well not yet drilled into sand. Drilled 1912.

Well No. M-25. Midwest Oil Company. Southwest quarter of northwest quarter of Section 36. Elevation at top of casing 4980 feet.

Commenced drilling March 15th, 1912.
Sand at 1123 feet.
Bottom of well at 1202 feet.
Sand was shaly. Did not show much oil until in the sand 75 feet, when it started to flow every fifteen minutes, making about 600 barrels. There was no shale oil.
Well completed March 30th, 1912.

Well No. M-27. Midwest Oil Company. Southwest quarter of southwest quarter of Section 36. Elevation at top of casing 4972 feet. Depth to Wall Creek sand 1229 feet. Total depth 1279 feet. Initial production 25 barrels. Present production 25 barrels. Drilled 1912.

Well No. M-28. Midwest Oil Company. Southwest quarter of southwest quarter of Section 36. Elevation at top of casing 4966 feet. Sand at 1234 feet. Drilled 1912.

Well No. M-29. Midwest Oil Company. Northeast quarter of northwest quarter of Section 1. Depth to Wall Creek sand 1278 feet. Total depth 1310 feet. The well produces water and oil.

Well No. M-30. Midwest Oil Company. Southeast quarter of southeast quarter of Section 36. Depth to Wall Creek sand 1287 feet. Oil at 1397 feet. Total depth 1447 feet.

Well No. M-31. Midwest Oil Company. Southwest quarter of northwest quarter of Section 2. The well produces oil and water. The record is not available.

Well No. M-35. Midwest Oil Company. Northwest quarter of southeast quarter of Section 26. Elevation at top of casing 5050. Total depth 1145 feet. Depth to Wall Creek sandstone 1095 feet. Initial production 250 barrels. Present production 150 barrels. Drilled 1911.

Well No. M-36. Midwest Oil Company. Northeast quarter of the southeast quarter of Section 26. Elevation at top of casing 5087 feet. Total depth 1138 feet. Initial production 250 barrels. Present production 200 barrels. Drilled 1911.

Well No. M-37. Midwest Oil Company. Center of Section 30, T. 40 N., R. 78 W. Total depth 1750 feet. The Wall Creek sandstone was not reached. The well is dry. Drilled 1910.

Well No. M-38. Midwest Oil Company. Northeast quarter of the northeast quarter of Section 36, T. 40 N., R. 79 W. Total depth 1470 feet. Drilled 1910. Record not available.

Well No. M-39. Midwest Oil Company. Southeast quarter of southwest quarter of Section 26. Depth to Wall Creek sandstone 990 feet. Total depth 1030 feet. Initial production 100 barrels. Drilled 1912.

Well No. M-40. Midwest Oil Company. Southwest quarter of southeast quarter of Section 26. Depth to Wall Creek sandstone 947 feet. Total depth 1009 feet. Initial production 150 barrels. Drilled 1912.

Well No. M-41. Midwest Oil Company. Northeast quarter of northwest quarter of Section 35. Depth to Wall Creek sandstone 924 feet. Total depth 974 feet. Initial production 75 barrels. Drilled in 1912.

Well No. M-42. Midwest Oil Company. Southeast quarter of northeast quarter of Section 34. Depth to Wall Creek sandstone 1046 feet. Total depth 1124 feet. Initial production 50 barrels. Drilled in 1912.

Well No. M-43. Midwest Oil Company. Northeast quarter of southwest quarter of Section 35. Depth to Wall Creek sandstone 1030 feet. Initial production 300 barrels. Drilled in 1912.

Well No. N-5. Northwestern Oil Company. Northwest quarter of southwest quarter of Section 2. Drilling.

Well No. N-6. Northwestern Oil Company. Northwest quarter of southwest quarter of Section 28. Drilling.

Well No. W-1. Wyoming Crude Oil Company. Northeast quarter of northeast quarter of Section 28. This well is not yet finished, the last reported depth being 1140 feet. The Shannon sandstone was struck at 360 feet, the sand continuing to 495 feet. A small amount of oil was obtained in the shale at 1140 feet and

again at 1600 feet. In January, 1914, this well was deepened by 11 feet and gushed 1000 barrels per day at first.

Well No. M-51. Midwest Oil Company Lease. Patented Land. Northeast quarter of Section 25. Shale 50 feet to 1185 feet. Sand 1185 feet to 1260 feet. Came in at 400 barrels, is now 100 barrels production.

Well No. BO-1. Bluestone Oil Company. Northeast quarter of Section 27. Well No. 1. Shale 40 feet to 1196 feet. Sand 1196 feet to 1260 feet. Finished well 64 feet in sand. Well capped—about 500 barrels.

Well No. C-1. Crescent Oil Company. Northeast quarter of Section 14. Shale 72 feet to 1400 feet. Sand 1410 feet to 1450 feet. Oil well flowing hard.

Well No. C-2. Crescent Oil Company. Southeast quarter of Section 35. Shale 35 feet to 1090 feet. Sand 1151 feet to 1222 feet. Oil at 75 feet. Reduced hole at 600 feet. Finished 100 barrel oil well.

Well No. C-3. Crescent Oil Company. Northeast quarter of Section 35. Shale at 60 feet to 1120 feet. Sand at 1160 feet to 1195 feet. Finished 100 barrel oil well.

Well No. CC-1. Castle Creek Oil Company, Lessee. South half of southwest quarter of Section 13. Shale 25 feet to 1222 feet. Sand 1230 feet to 1300 feet. Finished 25 barrel well.

Well No. CC-2. Castle Creek Oil Company. South half of southwest quarter of Section 13. Shale 25 feet to 1298 feet. Finished at top of sand; hit oil.

Well No. H-1. Henshaw Oil Company. Southwest quarter Section 29. Shale 70 feet to 2245 feet. Sand at 2245 feet. Dry well at 2250 feet. Finished.

Well No. Cal.-4. California Oil Company. Well No. 5. Section 25. Soil and shale at 60 feet. Shale 140 feet to 1210 feet. 6 5-8 inch casing at 1131 feet. Sand at 1210 feet. Steady flow of oil 500 barrels.

Well No. D-1. Dead Horse. Midwest Oil Company, owners, Section 16, 39 T. N., R. 81 W. Sand at 1416 feet. Finished in sand at 1426 feet. Dry hole.

Well No. F-61. Franco-Wyoming Company. Southwest quarter of Section 13, T. 40 N., R. 79 W. Drilling commenced October 21, 1912. Completed to top of sand (1220 feet) November 28, 1912. Drilling suspended until December, 1913, when this well was drilled 75 feet into the sand, where it produced very little oil but a large quantity of gas. Well was shot on December 15, 1913, with 180 quarts of nitro-glycerine and at present time

has an average daily production of 232 barrels. Total depth, 1295 feet.

FORMATION:—

Loose surface sand to 15 feet. Dark blue shale to 90 feet, where shale oil was found. Dark blue shale to 700 feet, where shale oil was found in considerable quantity. Dark blue shale to top of sand (1220 feet). Oil sand 75 feet.

WELLS OF THE SHANNON DISTRICT

Well No. F-21. Wyoming Oil Fields Company. Southeast quarter of southeast quarter of Section 36, T. 41 N., R. 79 W. Elevation at top of casing 4790 feet. Depth to Shannon sand 1000 feet. Total depth 1030 feet. This well was drilled in 1890, and was pumped almost continuously to the present time, producing four barrels of oil per day.

Well No. F-22. Wyoming Oil Fields Company. Southeast quarter of the southwest quarter of Section 31, T. 41 N., R. 78 W. Elevation at top of casing 4970 feet. Production two barrels of oil and two gallons of water per day. The log of the well follows:

Struck sand with water 700 to 745 feet.
Shale from 745 to 1082 feet. Crooked hole at 1082 feet.
Sand from 1082 to 1090 feet.
Water sand from 1090 to 1145 feet.
Shale 1145 to 1160 feet.
Oil sand 1160 to 1180 feet.
Cased with 6 5-8 casing to 1145 feet.
Well completed May 28th, 1911.

Well No. F-23. Wyoming Oil Fields Company. Southwest quarter of southwest quarter of Section 31. Elevation at top of casing 4970 feet. Production three barrels. The well record follows:

Commenced drilling August 21st, 1895.
Sand at 600 feet.
Water sand at 635 feet.
Cased with 7 5-8 inch casing to 645 feet.
Water at 1030 feet.
Cased with 5 5-8 inch casing to 1177 feet.
Light sand at 1084 feet.
Shut down October 27th, 1895 to April 25th, 1898.
Coarse, light-colored sand to 1137 feet.
Bottom of well 1137 feet.

Well No. F-24. Wyoming Oil Fields Company. Southwest quarter of southwest quarter of Section 31. Production three barrels of oil and two gallons of water. The log of the well follows:

Commenced drilling May 30, 1895.
Water at 544 feet.
Cased with 7 5-8 inch casing to 580 feet.
Water at 975 feet.
Cased with 5 5-8 inch casing to 990 feet.
Oil at 1040 feet.
Finished hole at 1075 feet.

Well No. F-25. Wyoming Oil Fields Company. Northeast quarter of northwest quarter of Section 1, T. 40 N., R. 79 W. Elevation at top of casing 4895 feet. Production four barrels.

Commenced drilling June 11th, 1911.
Shale to 400 feet.
Sand with small quantity of water 400 to 440 feet.
Shale from 440 to 842 feet.
Sand with water at 842 feet.
Oil sand at 926 feet.
Bottom of well at 978 feet.

Well No. F-26. Wyoming Oil Fields Company. Northeast quarter of northwest quarter of Section 1. Elevation at top of casing 4895 feet. Production seven barrels.

Commenced drilling January 26th, 1912.
Shale to 770 feet.
Sand with water 770 to 836 feet.
Total depth 904 feet.
Well completed February 24th, 1912.

Well No. F-28. Wyoming Oil Fields Company. Northwest quarter of northwest quarter of Section 1. Elevation at top of casing 4793 feet. Production 6 barrels.

Commenced drilling November 17th, 1894.
Water at 692 feet.
Oil at 769 feet.
Bottom of good sand at 790 feet.
Bottom of well at 809 feet.
Well completed February 20th, 1895.

Well No. F-29. Wyoming Oil Fields Company. Northwest quarter of northwest quarter of Section 1. Elevation at top of casing 4804 feet. Production six barrels.

Commenced drilling March 18th, 1895.
Water, sufficient for drilling at 350 feet.
Water at 755 feet.
Oil at 833 feet.
Bottom of hole at 873 feet.
Well completed May 1st, 1895.

Well No. F-30. Wyoming Oil Fields Company. Northwest quarter of northwest quarter of Section 1. Elevation at top of casing 4810 feet. Production seven barrels. Drilled 1902. Total depth 856 feet.

Well No. F-31. Wyoming Oil Fields Company. Northwest quarter of northwest quarter of Section 1. Elevation at top of casing 4790 feet. Production six barrels.

Commenced drilling May 30th, 1902.
Shale to 300 feet.
Sand at 300 feet.
Water at 335 feet.
Sand with water at 725 feet.
Oil at 796 feet.
Bottom of well at 838 feet.
Well completed June 12th, 1902.

Well No. F-32. Wyoming Oil Fields Company. Northwest quarter of northwest quarter of Section 1. Elevation at top of casing 4815 feet. Production six barrels.

Commenced drilling August 20th, 1902.
Sand at 265 feet.
Water at 280 feet.
Bottom of sand at 290 feet. Ten feet water-bearing.
Sand at 689 feet.
Bottom of water-bearing sand at 725 feet.
Sandy shale 725 to 927 feet.
Bottom of well at 967½ feet.

Well No. F-33. Wyoming Oil Fields Company. Southeast quarter of northwest quarter of Section 1. Elevation at top of casing 4819 feet. Production six barrels. Drilled 1902.

Water at 233 feet.
Sand with small amount of water 642 to 684 feet.
Light sand at 722 feet.
Bottom of hole at 767 feet.

Well No. F-34. Wyoming Oil Fields Company. Southeast quarter of northwest quarter of Section 1. Elevation at top of casing 4827 feet. Total depth 978 feet. Production seven barrels. Drilled 1911.

Well No. F-35. Wyoming Oil Fields Company. Southwest quarter of northwest quarter of Section 1. Elevation at top of casing 4802 feet.

Depth to Shannon sand 664 feet. Total depth 710 feet. Production eight barrels. Drilled 1910.

Well No. F-36. Wyoming Oil Fields Company. Southwest quarter of northwest quarter of Section 1. Elevation at top of casing 4810 feet. Depth to oil sand 724 feet. Total depth 779 feet. Production seven barrels. Drilled 1910.

Well No. F-37. Wyoming Oil Fields Company. Northwest quarter of northwest quarter of Section 1. Elevation at top of casing 4902 feet. Depth to oil sand 836 feet. Total depth 904 feet. Production 12 barrels. Drilled 1912.

Well No. F-38. Wyoming Oil Fields Company. Northwest quarter of northwest quarter of Section 1. Elevation at top of casing 4902 feet. Production 12 barrels. Drilled 1912.

Shale to 846 feet.
Sand with water 846 to 902 feet.
Oil sand 902 to 962 feet.
Bottom of well 962 feet.

Well No. F-39. Wyoming Oil Fields Company. Northwest quarter of northwest quarter of Section 1. Elevation at top of casing 4905 feet. Production 18 barrels. Drilled 1912.

Shale to 855 feet.
Sand with water 855 to 910 feet.
Bottom of well 992 feet.

Well No. F-40. Wyoming Oil Fields Company. Northwest quarter of northwest quarter of Section 1. Elevation at top of casing 4895 feet. Production 14 barrels. Drilled 1912.

Shale to 877 feet.
Sand with water 877 to 936 feet.
Bottom of hole 1008 feet.

Well No. F-41. Wyoming Oil Fields Company. Southeast quarter of southeast quarter of Section 36, T. 41 N., R. 79 W. Elevation at top of casing 4790 feet. Production five barrels. Drilled 1912.

Shale to 800 feet.
Sand with water at 800 feet.
Total depth 915 feet.

Well No. F-42. Wyoming Oil Fields Company. Northeast quarter of northwest quarter of Section 1, T. 40 N., R. 79 W. Elevation at top of casing 4904 feet. Production 10 barrels. Drilled 1912.

Shale to 856 feet.
Sand with water at 856 feet.
Oil at 910 feet.
Bottom of hole at 954 feet.

Well No. F-43. Wyoming Oil Fields Company. Northeast quarter of northwest quarter of Section 1. Elevation at top of casing 4902 feet. Production 10 barrels. Drilled 1912.

Shale to 880 feet.
Sand with water at 880 feet.
Oil at 936 feet.
Bottom of hole at 989 feet.

Well No. F-44. Wyoming Oil Fields Company. Northeast quarter of northwest quarter of Section 1. Elevation at top of casing 4912 feet. Depth to oil sand 933 feet. Total depth 986 feet. Production 10 barrels. Drilled 1912.

Well No. F-45. Wyoming Oil Fields Company. Elevation at top of casing 4900 feet. Depth to oil sand 990 feet. Total depth 1031 feet. Production 8 barrels. Drilled 1912. Southwest quarter of southwest quarter of Section 31, T. 41 N., R. 78 W.

Well No. F-46. Wyoming Oil Fields Company. Elevation at top of casing 4908 feet. Depth to oil sand 965 feet. Total depth 1025 feet. Production 10 barrels. Drilled 1912. Northeast quarter of northwest quarter of Section 1, T. 40 N., R. 79 W.

Well No. F-47. Wyoming Oil Fields Company. Southwest quarter of southwest quarter of Section 31, T. 41 N., R. 78 W. Elevation at top of casing 4890 feet. Production 10 barrels. Depth to sand 965 feet. Total depth 1023 feet. Drilled 1912.

Well No. F-48. Wyoming Oil Fields Company. Northwest quarter of northeast quarter of Section 1, T. 40 N., R. 79 W. Elevation at top of casing 4928 feet. Depth to oil sand 1010

feet. Total depth 1052 feet. Production 10 barrels. Drilled 1912.

Well No. F-49. Wyoming Oil Fields Company. Northwest quarter of northwest quarter of Section 1, T. 40 N., R. 79 W. Elevation at top of casing 4942 feet. Depth to oil sand 1043 feet. Total depth 1078 feet. Production 10 barrels. Drilled 1912.

Well No. F-50. Wyoming Oil Fields Company. Southeast quarter of northeast quarter of Section 2. Elevation at top of casing 4824 feet. Drilled 1905.

Bottom of first water at 301 feet.
Bottom of second water sand at 730 feet.
Oil sand at 772 feet.
Bottom of well at 858 feet.
Production six barrels.

Well No. F-51. Wyoming Oil Fields Company. Southeast quarter of northeast quarter of Section 2. Elevation at top of casing 4820 feet. Depth to oil sand 875 feet. Production six barrels. Drilled 1905.

Well No. F-52. Wyoming Oil Fields Company. Southeast quarter of northeast quarter of Section 2. Elevation at top of casing 4818 feet. Production six barrels. Drilled 1905.

Bottom of first water sand at 230 feet.
Sand with water 625 to 655 feet.
Oil sand at 720 feet.
Bottom of hole 800 feet.

Well No. F-53. Wyoming Oil Fields Company. Southeast quarter of northeast quarter of Section 2. Elevation at top of casing 4820 feet. Depth to oil sand 730 feet. Total depth 800 feet. Production six barrels. Drilled 1905.

Well No. F-54. Wyoming Oil Fields Company. Southwest quarter of northwest quarter of Section 1. Elevation at top of casing 4813 feet. Production 1-3 barrel oil, one barrel water and a small amount of gas. Drilled 1912.

Shale to 292 feet.
Sand with water 292 to 470 feet.
Shale from 470 to 1350 feet.
Well abandoned at 1350 feet.

Well No. F-55. Wyoming Oil Fields Company. Southeast quarter of southeast quarter of Section 36. Elevation at top of casing 4788 feet. Drilled 1901.

Sand with water from 600 to 630 feet.
Sand with water from 1020 to 1060 feet.
Vein of water at 1093 feet.
Light gray sand which produced a little water at 1780 feet.
Bottom of light gray sand at 1787 feet.
Bottom of hole at 2345 feet.
No oil in well.

Well No. 56. Wyoming Oil Fields Company. Northwest quarter of southwest quarter of Section 1. Elevation at top of casing 4822 feet. The record of this well is not available. It is reported to produce oil, gas, and water in small amounts.

Well No. F-57. Wyoming Oil Fields Company. Southeast quarter of southwest quarter of Section 1. Elevation at top of casing 4810 feet. The well produces no oil. Drilled 1912.

Sand with water from 460 to 480 feet.
Shale 480 to 700 feet.
Well abandoned at 700 feet.

Well No. F-58. Wyoming Oil Fields Company. Southeast quarter of southwest quarter of Section 1. Elevation at top of casing 4817 feet. The record of this well is not available. It is reported to be dry. Drilled 1912.

Well No. F-59. Wyoming Oil Fields Company. Southeast quarter of southeast quarter of Section 36, T. 41 N., R. 79 W. Elevation at top of casing 4786 feet. Total depth 1196 feet. The well produces a large quantity of water with no oil.

Well No. F-60. Wyoming Oil Fields Company. Southeast quarter of northeast quarter of Section 2, T. 40 N., R. 79 W. Drilled 1905.

Bottom of first water sand at 336 feet.
Top of second water sand at 736 feet.
Bottom of third water sand at 822 feet.
Oil sand at 826 feet. Showing of oil and gas.
Well abandoned at 1300 feet.
No oil in the well.

Wells Obtaining Oil in Shale

Well No. E-1. Eclipse Oil Company. Northwest corner of northwest quarter of Section 11, T. 39 N., R. 79 W. Elevation at top of casing (barometric) 5018 feet. The well was abandoned at a depth of 322 feet on account of a crooked hole. Reported to produce 50 barrels of oil per day when pumped. Drilled in 1912.

Well No. E-5. Eclipse Oil Company. Southwest corner of the northwest quarter of Section 12. Elevation at top of casing (barometric) 4930 feet. This well, which has not reached the Wall Creek sand, produces 30 barrels of oil per day when pumped. Total depth 1258 feet. Drilled in 1912.

Well No. F-5. Wyoming Oil Fields Company. Southwest quarter of southwest quarter of Section 13, T. 40 N., R. 79 W. Elevation at top of casing 4893 feet. Total depth 175 feet. Reported to produce 10 barrels of oil per day. Drilled 1910.

Well No. F-8. Wyoming Oil Fields Company. Southwest

corner of southwest quarter of Section 19. Elevation at top of casing (barometric) 4920 feet. Total depth 992 feet. The well has not reached the Wall Creek sandstone. Initial production 100 barrels. Present production 50 barrels. Drilled 1911. January, 1914, reported "shut in".

Well No. F-9. Wyoming Oil Fields Company. Southwest corner of northwest quarter of Section 19, T. 40 N., R. 78 W. Elevation at top of casing, (barometric) 4930 feet. Total depth 910 feet. The Wall Creek sand has not been reached. Initial production 75 barrels. Present production 25 barrels. Drilled 1911. Shut in. Report 1914.

Well No. F-10. Wyoming Oil Fields Company. Northwest quarter of Section 30. Elevation at top of casing (barometric) 4905 feet. Total depth 1186 feet. The Wall Creek sand has not been reached. Initial production 250 barrels. Present production 50 barrels. Drilled 1911. Shut in report 1914.

Well No. H-1. Hjorth Oil Company. Northwest quarter of northwest quarter of Section 33, T. 40 N., R. 79 W. Drilled 1912. This well, which is located in the trough of the Bothwell syncline, obtained oil at a depth of 1560 feet. Artesian water was struck at a depth of 235 feet, the water flowing 15 feet above the surface through a ten-inch pipe. The Wall Creek sandstone lies several hundred feet below the bottom of this well. It is probable that water will be obtained if this well is continued to the sand. The well is now flowing about 300 barrels of oil per day. The initial production was 500 barrels.

Well No. M-11. Midwest Oil Company. Southwest quarter of northwest quarter of Section 25. Elevation at top of casing 4934 feet. A shale well 1050 feet deep. Produces 15 barrels of oil per day when pumped. Drilled 1908.

Well No. M-19. Midwest Oil Company. Northwest quarter of northwest quarter of Section 36. Elevation at top of casing 4938 feet.

Commenced drilling February 17th, 1912.
Oil sand at 1080 feet.
Bottom of hole at 1161 feet. Formation was very shaly. Quit in a hard shell.
Shale oil at 400 feet.
Well completed March 9th, 1912.

Well No. M-21. Midwest Oil Company. Northwest quarter of northwest quarter of Section 36. Elevation at top of casing 4947 feet.

Commenced drilling February 17th, 1912.
Feb. 20. Shut down until morning on account of gas. Depth 230 feet.
Feb. 21. Oil at 260 feet.
Feb. 23. Oil at 540 feet.
Feb. 27. Put in 620 feet of 8-inch casing.
Mar. 1. Hung up at 1000 feet. Tools in hole.

Mar. 6. Pulled 8-inch casing. Top of sand at 1080 feet.
Mar. 7. Put in 1081 feet of 6 5-8 inch casing. 800 feet of oil in hole.
Mar. 10. Finished hole at 1161 feet. Shale to 1080 feet.

Well No. M-26. Midwest Oil Company. Southwest quarter of northwest quarter of Section 36. Elevation at top of casing 5011 feet. A large flow of oil was obtained in the shale at 1010 feet. The well was not drilled to the sand.

Well No. M-32. Midwest Oil Company. Northeast quarter of southwest quarter of Section 11. Depth to Wall Creek sand 1845 feet. Total depth 1850 feet. A small amount of oil was obtained at 640 feet. The well produces water with a small quantity of oil. Drilled in 1911.

Well No. M-33. Midwest Oil Company. Southeast quarter of northeast quarter of Section 11, T. 39 N., R. 79 W. The well has not reached the sand. Oil was struck in the shale at a depth of 1176 feet. Initial production 600 barrels. Present production 150 barrels. Drilled 1910.

Well No. M-34. Midwest Oil Company. Southeast quarter of southwest quarter of Section 27, T. 40 N., R. 79 W. The well has not reached the sand. Total depth 1350 feet. Oil was struck in the shale. Initial production 250 barrels. Present production 200 barrels. Drilled in 1912.

Well No. M-44. Midwest Oil Company. Southeast quarter of northwest quarter of Section 2, T. 39 N., R. 79 W. Oil was obtained in the shale at a depth of 1140 feet. Drilled 1911.

Well No. M-45. Midwest Oil Company. Northeast quarter of northeast quarter of Section 1. Oil was obtained in the shale at a depth of 430 feet. Drilled 1910.

Well No. M-46. Midwest Oil Company. Southeast quarter of northeast quarter of Section 14, T. 40 N., R. 79 W. Oil was obtained in the shale at a depth of 658 feet. Drilled 1911. Deepened to 1410 feet in November, 1913, and 500 barrels secured.

Well No. N-1. Northwestern Oil Company. Northeast quarter of southwest quarter of Section 2, T. 39 N., R. 79 W. Wall Creek sand was not reached.

Shale to 1175 feet.
Sand with oil 1175 to 1190 feet.
Bottom of well at 1198 feet.
Showings of oil were obtained at 300, 640, 800, 900, and 1190 feet.
The well produces 45 barrels of oil per day when pumped.
Drilled 1912.

Well No. N-2. Northwestern Oil Company. Northwest quarter of southeast quarter of Section 2, T. 39 N., R. 79 W.

Shale to 1270 feet.
Hard sandy formation 1270 to 1420 feet.
Sand from 1420 to 1488 feet.
Bottom of well at 1488 feet.

The sand contained no oil and but a small quantity of water. The well was shot with 230 quarts of nitro-glycerine. Gas and water were obtained, the water flowing over the top of the derrick. After the first flow the water subsided and stood at a point 200 feet above the bottom. The well was plugged at 1460 and 1478 feet. Oil was obtained at 392 feet. The well is reported to yield 45 barrels of oil per day when pumped. Drilled 1912.

Well No. N-3. Northwestern Oil Company. Northeast quarter of southwest quarter of Section 34.

Shale to 1412 feet.
Hard sandy shale from 1412 to 1855 feet.
Sand from 1855 to 1890 feet. Small amount of water in sand—about three barrels per day.
Showing of oil at 300 feet.
The well was plugged at the bottom and abandoned.
Drilled 1912.

Well No. N-4. Northwestern Oil Company. Northwest quarter of southwest quarter of Section 2, T. 39 N., R. 79 W.

Shale to 900 feet. At 900 feet the tools passed into the cavity. Before the tools could be removed the well flowed three times. Although the hole was ten inches in diameter, the oil flowed over the top of the derrick. Total depth 912 feet. Wall Creek sandstone not reached. Showing of oil at 130 feet. Initial production 345 barrels. Present production 210 barrels. Drilled 1912.

Well No. M-50. Midwest Oil Company. Northeast quarter of Section 8, T. 39 N., R. 79 S.

Shale 40 feet to 445 feet.
Sand 445 feet to 569 feet.
Shale 569 to 1110 feet.
Oil and gas at 1188 feet.
Shale and sand 1110 feet to 1235 feet.
Shale 1235 to 1814 feet.
Production, about 4 barrels.

Well No. M-52. Midwest Oil Company. Northeast quarter of Section 36, T. 40 N., R. 79 W. Five barrel oil well. Shale at 108 feet. Finished.

Well No. EO-1. Economy Oil Company. Southwest quarter of Section 27.

Shale 50 feet to 1515 feet.
Small streak of oil at 1300 feet.
Small streak of oil and gas at 1370 feet.
Oil and gas at 1465 feet.
Finished at 1515 feet.
Production, about 70 barrels.

Well No. WC-1. Wyoming Crude Oil Company. Drilled in southwest quarter of southeast quarter of Section 28 in January 1913 with small production. In January 1914, this was deepened to 1600 feet and a 1000 barrel estimated production secured at first. The Wall Creek sand is about 400 feet below the bottom of the well.

Well No. Cal.-1. California Oil Company. Southeast quarter of Section 36, T. 40 N., R. 79 W. Five barrel well. Shale at 90 feet. Finished.

Well No. Cal.-2. California Oil Company. Southwest quarter of Section 36, T. 40 N., R. 79 W. One barrel well. Shale 150 feet. Finished.

Well No. Cal.-3. Northwest quarter of Section 36, T. 40 N., R. 79 W. Two barrel well. Shale 110 feet. Finished.

Well No. W-1. Wyoming Pure Oil Company. Northwest quarter of Section 4, T. 39 N., R. 79 W.

Shale at 20 to 200 feet.
Shannon sand at 160 feet.
Sand and shale 200 feet to 410 feet.
Shale 460 feet to 2335 feet.
Stain of oil 1015 feet.
Small streak of oil 1160 feet.
Gas at 1340 feet.
Hole caved in and was shut down at 2335 feet.

Well No. P-1. Pine Dome Oil Company. Lease on school land, Section 16. Drilled to 2150 feet in southeast corner of section and secured initial flow of 300 barrels in January, 1914.

TRANSPORTATION AND MARKET

The oil produced in the district is transported through the pipe lines of the Midwest Oil Company and the Natrona Pipe Line and Refinery Company to the refineries at Casper. The refined products, gasoline, benzine, kerosene, distillate, and lubricants, are shipped in drums, cans, and tank cars to the distributing points. At present the Salt Creek oils are marketed in Wyoming, Colorado, Nebraska, North Dakota, South Dakota, Montana, Idaho, Utah and Canada. The residue, left after refining, is sold to the Standard Oil of Indiana to be worked into Motor spirits and fuel oil. This company's new million dollar plant at Casper will be in operation early in 1914.

Beside the residue going to the Standard a limited amount is sold as fuel oil to local power plants and to the railroads. The Midwest contracts 4000 barrels per day to the C. & N. W. R. R., and the Franco Company 1000 barrels per day to the C. B. & Q. R. R.

Storage

The combined storage capacity of the Midwest and Franco Companies is about one million and a quarter barrels. This is being enlarged by the building of new tanks by both companies. The oil of all grades in storage the first of the year 1914, was about nine hundred thousand barrels.

Refineries

The refinery capacity of the Midwest Company is 11,000 barrels per day. The capacity of the old Franco plant is 1,000 barrels; and of the new Franco plant 5,100 barrels; a total capacity for Salt Creek crude of 17,100 barrels per day.

These are simply skimming plants, taking off the gasoline and kerosene which are sold under contract to the Texas Company and the Continental Oil Company. The gasoline and kerosene content of the crude is about 37 per cent. and about 10 per cent. of naptha and gas oil is taken out in addition, leaving about 53 per cent. of residue.

Production of the Field

The production of the field is limited by the capacity of the refineries. The maximum capacity of the refineries is about 18,000 barrels per day; the Midwest refineries handling 11,800 barrels and the Franco refinery 6,100. The Standard Refinery, handling only the lower ends from the other refineries, will not add to this total.

The field production, then, cannot run over 18,000 barrels until the refinery capacity is increased. Many wells now capped can be opened to increase the field production when such is required.

It is estimated that up to January 1, 1914, the Midwest had drawn a total of two and a half million barrels from the field, and the Franco about three-quarters of a million barrels; a total of three and a quarter million barrels.

According to statistics filed with the State Auditor, by the producers, the production for 1913 was as follows:

Midwest	NW¼ NW¼ 36-40-79	491,593 barrels
Midwest	NW¼ SW¼ 13-40-79	214,133 barrels
Midwest	SW¼ NE¼ 25-40-79	237,871 barrels
California	SW¼ SW¼ 36-40-79	20,340 barrels
California	SW¼ SW¼ 25-40-79	203,904 barrels
Economy	SW¼ 27-40-79	19,996 barrels
Castle Creek	S½ SW¼ 13-40-79	350,308 barrels
Northwestern	NW¼ SW¼ 28-40-79	12,612 barrels
Hanley & Bird	NE¼ 3-39-79	174,303 barrels
Wyo. Crude Oil	NE¼ NE¼ 28-40-79	5,653 barrels
Keystone	33-40-79	5,390 barrels
Wyo. Oil Field Co.	13-40-79	
Wyo. Oil Field Co.	22-40-79	
Wyo. Oil Field Co.	23-40-79	
Wyo. Oil Field Co.	24-40-79	
Wyo. Oil Field Co.	26-40-79	538,739 barrels
Wyo. Oil Field Co.	1-40-79	
Wyo. Oil Field Co.	2-40-79	
Wyo. Oil Field Co.	36-40-79	
Wyo. Oil Field Co.	31-41-79	
		2,274,842 barrels
Total		2,274,842 barrels

The production from the Midwest and California Oil Company from the school section and the amounts paid in royalty to the State are given below:

Jan.	1913	46,080 barrels	$2,304.00 royalty
Feb.	1913	43,811 barrels	2,190.55 royalty
March	1913	46,077 barrels	2,303.85 royalty
April	1913	43,134 barrels	2,156.70 royalty
May	1913	42,009 barrels	2,100.45 royalty
June	1913	43,173 barrels	2,158.65 royalty
July	1913	44,036 barrels	2,201.80 royalty
August	1913	42,512 barrels	2,125.60 royalty
Sept.	1913	39,768 barrels	1,988.40 royalty
Oct.	1913	40,167 barrels	2,008.35 royalty
Nov.	1913	40,676 barrels	2,033.80 royalty
Dec.	1913	40,490fbarrels	2,024.50 royalty
		511,933 barrels	$25,596.95 royalty

The royalty for 1912 amounted to $21,915.15, being 5 cents per barrel upon a production of 223,304 barrels. Several wells upon Section 36 are capped and make no production. The income to the State would be considerably larger if all the wells were drawn upon.

While the refining companies are buying crude oil from the producers at fifty cents per barrel and even less, at the present time, it is evident that the oil is worth a higher price. Comparison of analyses shows that it in-

trinsically is worth about $2.25 per barrel. Outside refineries cannot probably enter in competition as the pipe line (owned by the Midwest Refining Co.) charges and railroad freight charges would prohibit. It is said that outside refineries are offering $1.60 per barrel for the light oil from the Douglas field, f. o. b., and the producers of the Spring Valley field are receiving $1.50 per barrel f. o. b. for their oil. For analyses see page 123. On a competitive market the Salt Creek oil would sell for probably four times the present price.

Life of the Field

Up to the present time it is impossible to make an estimate of the total oil content of the Salt Creek Dome. The sands are of varying density and therefore vary in oil content per cubic foot of sandstone. The rate of rise of water line cannot yet be stated. Some wells show an increase in water production, but so far as the public can learn, there seems to be no regularity or relation between the water increase in neighboring wells.

COST OF DRILLING.*

In the Salt Creek district the cost of drilling is not excessive as the strata overlying the oil sands are not hard and the wells are not of great depth. Labor contracts may be made at $1.25 per foot, the operator furnishing rig, casing, fuel and water. Depth limit 2000 feet.

The approximate cost of the various styles of rigs is given below:

Standard wooden rig with rig irons, machinery, tools and cordage	$4,625.00
Rig timbers and lumber	700.00
Freight to the field, 52,000 pounds	375.00
Erecting derrick	250.00
Total	$5,950.00
Standard steel rig	$1,725.00
Machinery, tools and cordage	4,225.00
Freight to the field	350.00
Erecting derrick	250.00
Total	$6,550.00

*Jamison, Salt Creek Field, 1912.

Portable rig (Star No. 28)	$1,600.00
Boiler, tools and cordage	3,885.00
Freight to the field	350.00
TOTAL	$5,735.00

(The above figures were supplied by Mr. J. S. Mechling of the Oil Wel Supply Company's store at Casper.)

The cost of casing is as follows: 10-inch, 32-lb., $1.14 per foot; 8¼-inch, 24-lb., $0.87½ per foot; 6 5-8-inch, 17-lb., $0.61½ per foot, all f. o. b. Casper.

Machinery and supplies are hauled to the field by freight teams, the cost being 75 cents per 100 pounds in the summer and 85 cents per 100 pounds in the winter.

Labor costs are as follows: Drillers, $6.00 per day with board; tool-dressers, $5.00 per day with board; laborers, $2.50 to $3.00 per day with board; cooks, $45.00 per month with board; team and driver, $5.00 per day with board and horse-feed.

The cost of an average well will be about as follows:

Depth of well 1200 feet. Rate of drilling 60 feet per day.	
2 drillers 20 days at $6.00	$240.00
2 tool dressers 20 days at $5.00	200.00
1 teamster with team 20 days at $5.00	100.00
1 cook	30.00
Supplies, etc.	75.00
200 feet of 10-inch casing	228.00
600 feet of 8¼-inch casing	525.00
1100 feet of 6 5-8-inch casing	676.50
	$2,074.50
Portable rig, complete	5,385.00
Freight to the field, machinery and casing	650.00
TOTAL	$8,109.50

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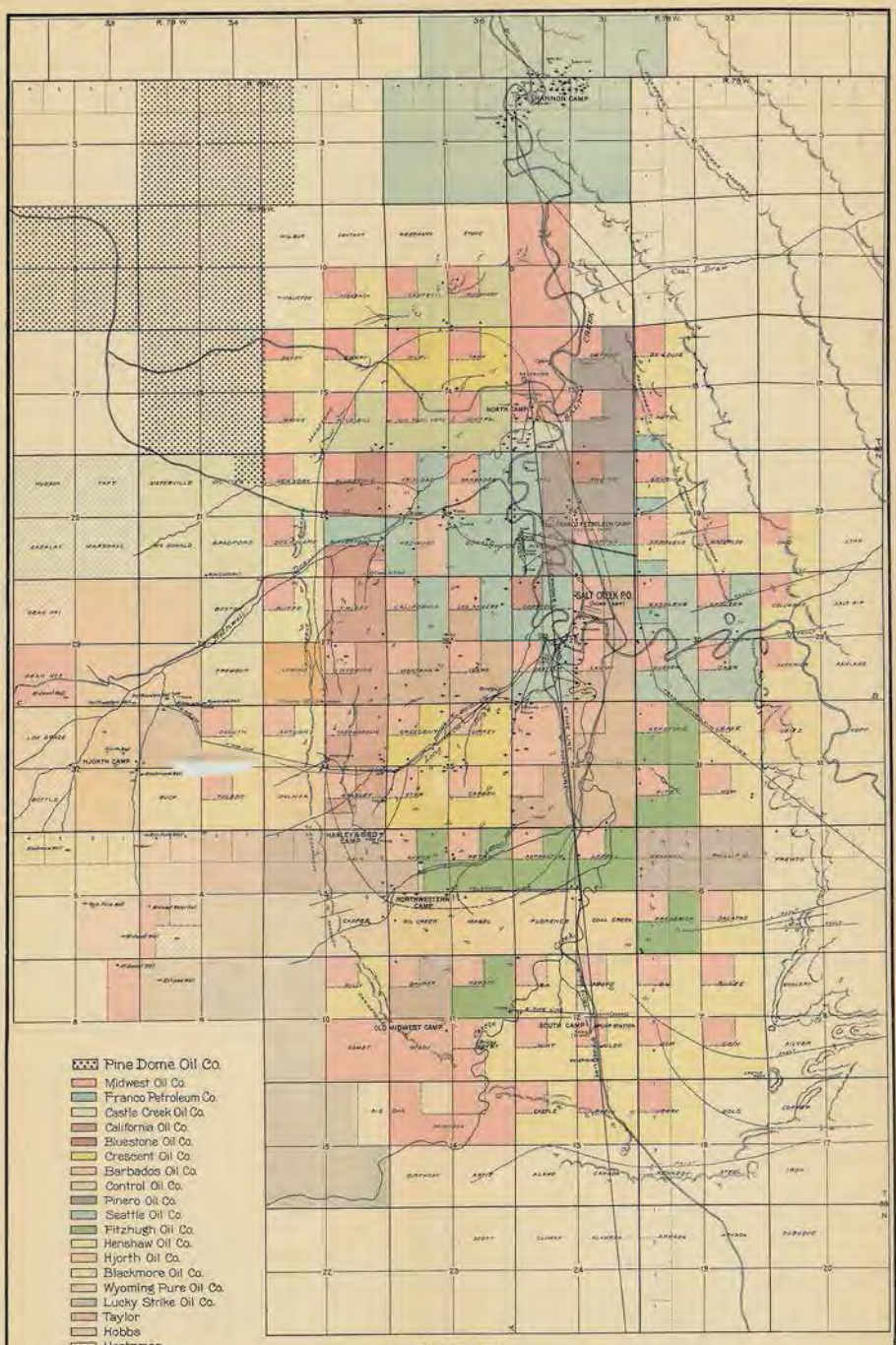

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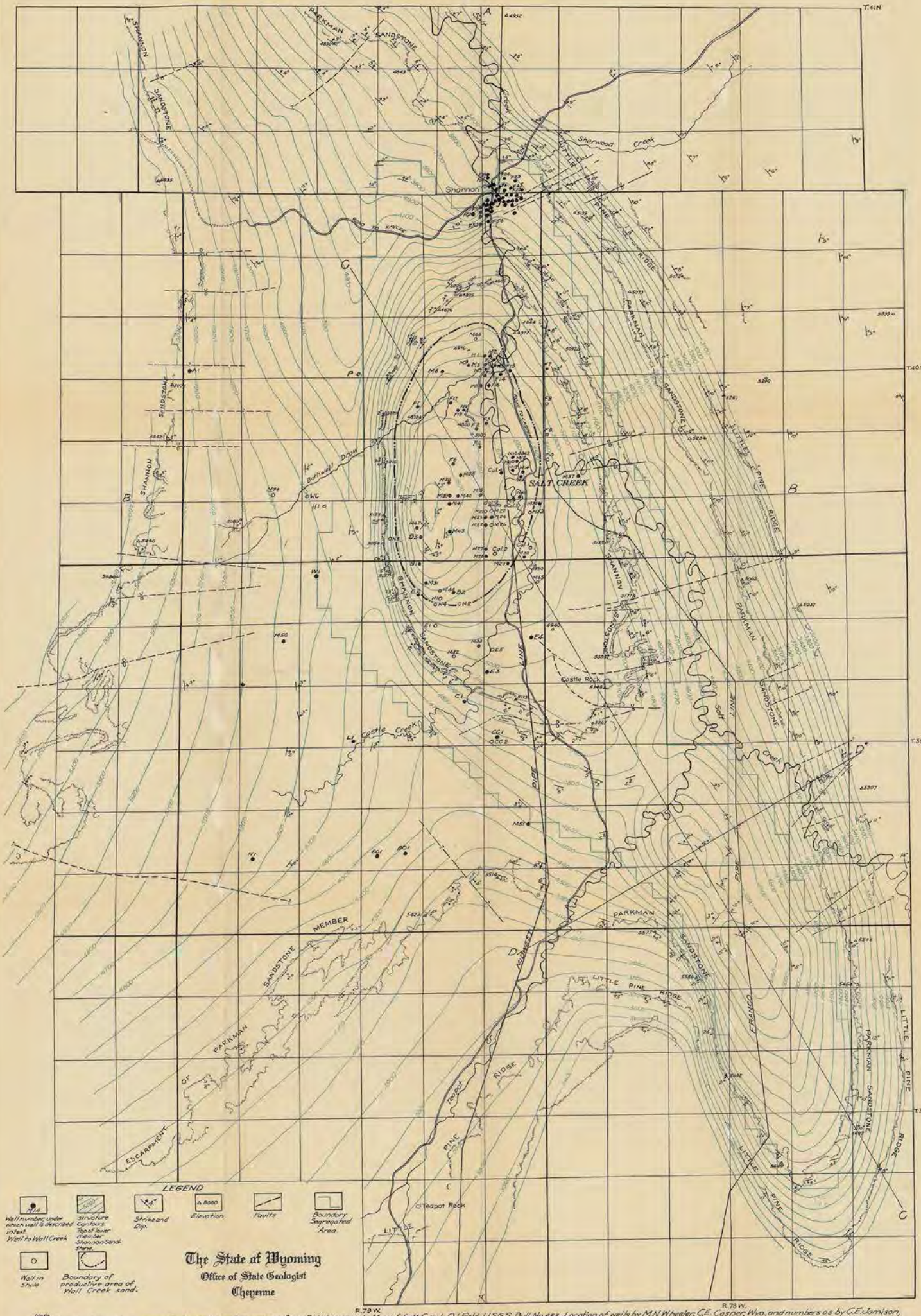
THE SALT CREEK OIL FIELD

1914



LEGEND

Well number; under which well is described in text. Well to Wall Creek

Structure Contours. Top of lower member Shannon Sandstone.

Strike and Dip.

Elevation

Faults

Boundary Segregated Area

Well in Shale

Boundary of productive area of Wall Creek sand.

The State of Wyoming
Office of State Geologist
Cheyenne

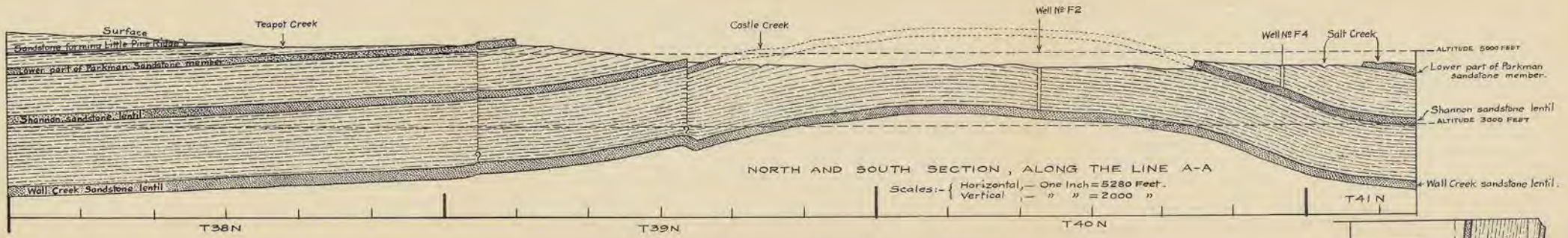
Note: Compiled from various sources. Geology and structure contours from C.H. Wegemann's Map of Salt Creek Oil Field. U.S.G.S. Bull. No. 452. Location of wells by M.N. Wheeler, C.E. Casper, Wyo., and numbers as by C.E. Jamison, Bull. No. 4, State Geologist Office. Wells drilled during 1913, located from statments by owners.

L.W. Trumbull, State Geologist.

PLATE 6.

GRD.

PLATE 7.

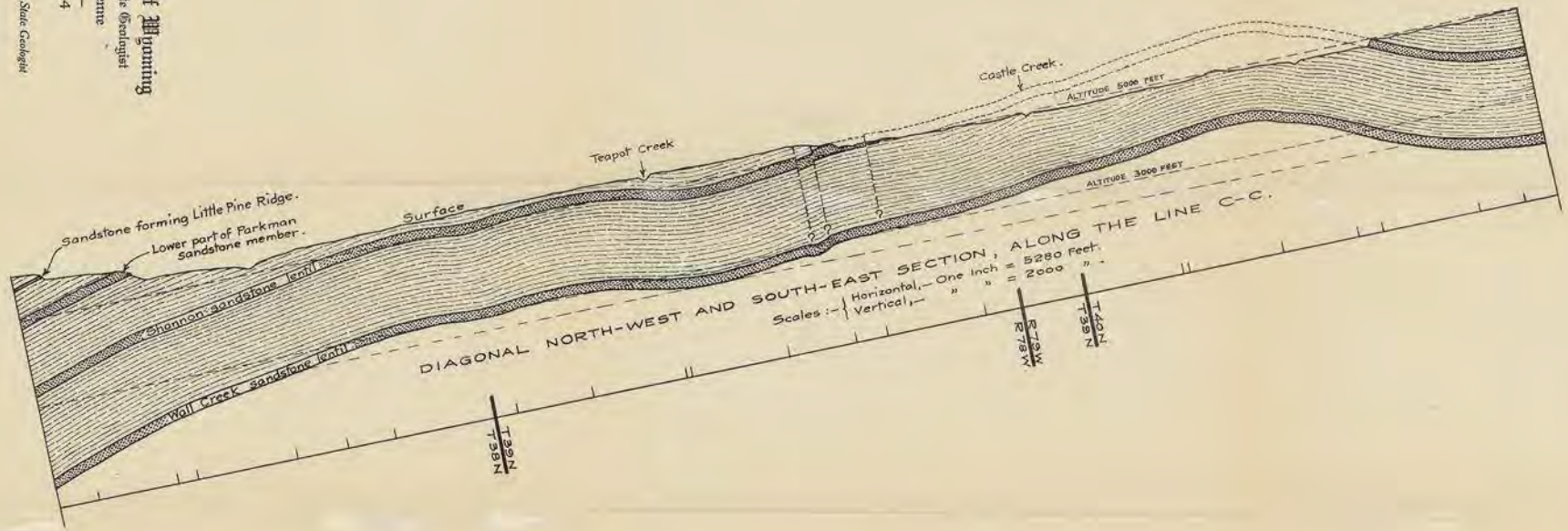


NORTH AND SOUTH SECTION, ALONG THE LINE A-A

Scales:- { Horizontal, — One Inch = 5280 Feet.
Vertical, — " " = 2000 "

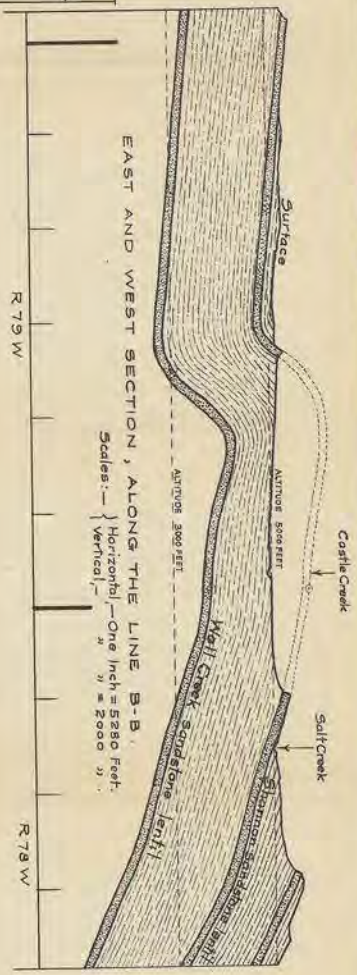
The State of Wyoming
Office of State Geologist
Cheyenne
1914

L. W. Trumbull, State Geologist



DIAGONAL NORTH-WEST AND SOUTH-EAST SECTION, ALONG THE LINE C-C.

Scales:- { Horizontal, — One Inch = 5280 Feet.
Vertical, — " " = 2000 " .



EAST AND WEST SECTION, ALONG THE LINE B-B.

Scales:- { Horizontal, — One Inch = 5280 Feet.
Vertical, — " " = 2000 " .