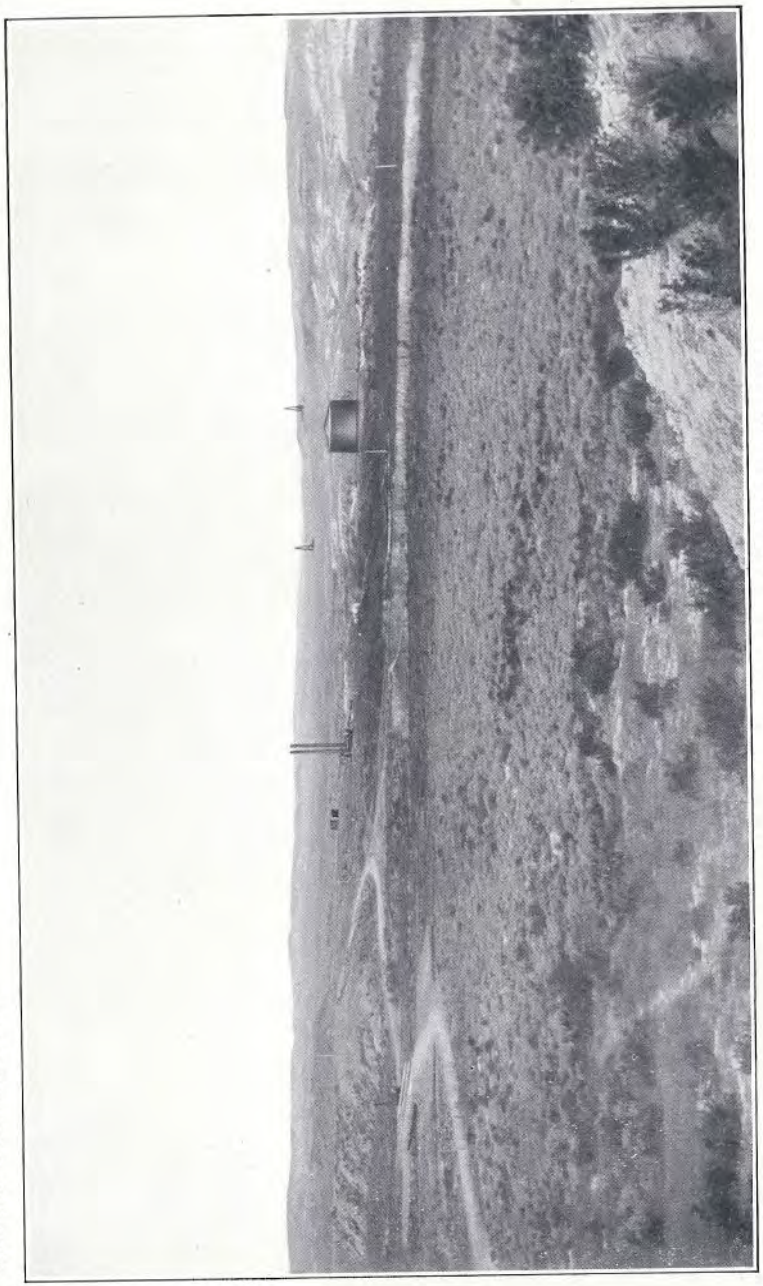

General View of a Portion of the Salt Creek District.

Bulletin 4 Series B

The Salt Creek Oil Field

Natrona County, Wyo.

C. E. JAMISON
State Geologist

1912
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CHEYENNE

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ILLUSTRATIONS

The Salt Creek Oil Field
Natrona County, Wyo.

By C. E. JAMISON

INTRODUCTION.

During the last two years the region lying north of Casper, Wyoming, near the northern border of Natrona County, has shown promise of becoming an important factor in the production of high grade oils of paraffin base.

The developed field lies in townships 39 and 40 north, ranges 78 and 79 west of the sixth principal meridian, in the drainage basin of Salt Creek, the wells obtaining their oil from a sandstone in the upper portion of the Benton formation, which underlies the region. The extremely high grade of the oil, which ranges from 37° to 43° Beaume, and the great productiveness of the wells, which yield from 20 to 1200 barrels of oil per day, are among the things which are attracting wide-spread attention to the region.

South and west of the Salt Creek field are districts which are similar, in surface indications, to the proven territory, while on the north is the Shannon field, producing a somewhat heavier oil, chiefly valuable for lubricating purposes.

The field work on which this report is based was carried on in July and August, 1912, for the purpose of studying

the occurrence of the oil, the structure and extent of the oil-bearing sandstones and their relations to the associated formations. The area discussed in this report is indicated on Plate II.

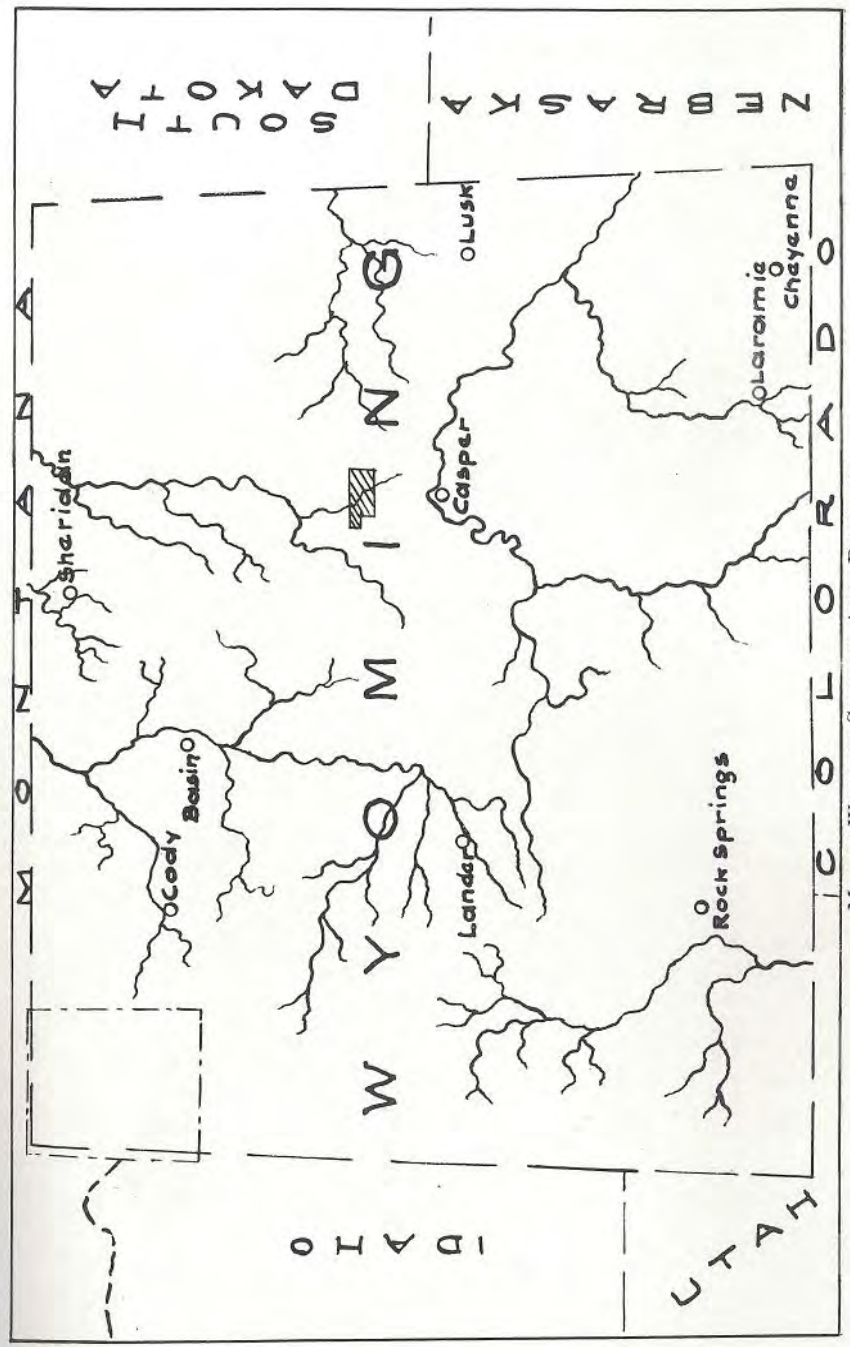
LOCATION.

The region discussed in this report as the Salt Creek district lies about 45 miles north of Casper, Wyoming, and includes parts of townships 39, 40, and 41 north, ranges 78, 79, and 80 west. The region is included between 106° 10′ to 106° 30′ west longitude and 43° 20′ to 43° 30′ north latitude. Salt Creek, a post office recently established, is situated near the center of the field at the junction of Salt and Castle Creeks. Wagon roads enter the district from Casper on the south by way of Horse Ranch; from Bucknum on the southwest by way of 33-Mile; from Tisdale on the west by way of Wall Creek and Scott's ranch; and from Buffalo on the north by way of Kaycee.

Casper, population about 2500, a division point on the Chicago & Northwestern Railway, is the nearest railroad town and supply point. Located there are two banks, an oil well supply store, two newspapers, the county court house, and the refineries of the Midwest and Natrona Pipe Line companies. Stages make the trip from Casper to the field tri-weekly.

For convenience the district is here divided into the Salt Creek field, the Shannon field, the Dugout Creek field, and the Teapot dome. The product of the Salt Creek field is a green oil ranging from 37° to 43° Beaume. The product of the Shannon field is a dark green oil varying in gravity from 22° to 26° Beaume. As yet no wells have

Bulletin 4, Series B. Plate II.



Wyoming State Geologist.

Map of Wyoming Showing Area Discussed.

been drilled in the Teapot dome or the Dugout Creek field. The Teapot dome will not be discussed in detail in this report.

ACKNOWLEDGMENTS.

During the course of the examination L. M. Trask of Cheyenne acted as general assistant. C. E. Colby of Cheyenne and George Blackstone of Casper were employed as camp assistants during parts of the work. Mr. C. H. Wegemann's report* on the field has been consulted for some of the geology of the eastern portion of the district. That portion of this report which relates to the records and production of the wells could not have been written without the assistance of the managers and officers of the various companies, and the writer therefore acknowledges his indebtedness to them for their support and co-operation. The writer is particularly indebted to Messrs. Pierre Eugene Caplane and L. J. A. Phillipot of Paris, France; Mr. C. de Ryck of The Hague, Holland; Mr. W. D. Waltman, manager of the Wyoming Oil Fields and Natrona Pipe Line companies; Mr. B. B. Lummis, engineer for the Wyoming Oil Fields Company; Mr. S. A. Lane, field superintendent for the Wyoming Oil Fields Company; Mr. R. D. Brooks, manager of the Midwest Oil Company; Mr. N. S. Wilson, superintendent for the Midwest Company; Mr. A. G. Hopkins, of the Northwestern Oil Company; Mr. S. S. Doty of the Eclipse Oil Company; Mr. J. B. Bradley of the Bradley & Hanley company; Mr. E. O. Orchard of the Lucky Strike Oil Company; Messrs. W. E. Badger and John McFadden of Findlay, Ohio; Mr. A. D. McDonald of Tulsa,

*The Salt Creek Oil Field. U. S. Geol. Survey Bulletin 452. 1911.

Oklahoma; Mr. C. W. Dehne of Moorcroft, Wyoming; Messrs. R. H. Nichols, E. T. Williams, Wm. Hines, H. H. Beagle, J. H. Scott, S. Soloman, and F. D. Salathe of Casper, Wyoming; Mr. J. S. Mechling of the Oil Well Supply Company; Mr. R. D. Tyler of Cheyenne, Wyoming, and to many others whose assistance in obtaining the necessary data has aided materially in the preparation of this report.

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Contains an incomplete analysis of the Shannon oil.

1889

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BEELER, H. C. Wyoming mines and minerals.

Contains an analysis of the Shannon oil.

1906

DARTON, N. H. Geology of the Bighorn Mountains. U. S. Geol. Survey Professional Paper No. 51.

Describes the general geology of the region.

REDWOOD, BOVERTON. Petroleum and its products.

Contains incomplete analyses of the Shannon oil.

1908

DARTON, N. H. Paleozoic and Mesozoic of central Wyoming. Bulletin Geol. Soc. America, Vol. 19 pp. 403-470.

Describes the general geology of the region.

BEELER, H. C. The State of Wyoming.

Contains an analysis of the Shannon oil.

1910

SHAW, E. W. The Glenrock Coal Field, Wyoming. U. S. Geol. Survey Bulletin 341.

Describes the geology of the region with reference to coal.

1911

WEGEMANN, C. H. The Salt Creek oil field, Natrona County. U. S. Geol. Survey Bulletin 452.

Describes the geology of the field and lists numerous fossils. Contains a geologic map of, and sections across the field.

1912

WEGEMANN, C. H. The Powder River oil field, Wyoming. U. S. Geol. Survey Bulletin 471.

Describes the geology of the western portion of the district. Contains analyses of the oil.

DEFINITION OF PLACE NAMES.

In the following paragraphs certain names as used in the district are defined:

BOTHWELL DRAW.—An intermittent stream flowing northeasterly and emptying into Salt Creek in section 13, T. 40 N., R. 79 W., near the Iba oil spring.

CASTLE CREEK.—An intermittent stream entering the Salt Creek dome at its southern extremity and flowing northward to the center of section 25, T. 40 N., R. 79 W., where it empties into Salt Creek.

CASTLE ROCK.—An isolated butte of Shannon sandstone in the northwest corner of section 17, T. 39 N., R. 78 W. Elevation 5402 feet.

COAL DRAW.—A small intermittent stream flowing into Salt Creek near the northern end of Salt Creek dome. The coal which outcrops near its head gives the name to the stream.

COLD SPRING CREEK.—A name sometimes applied to Little Teapot Creek.

DAKOTA SAND.—A coarse grained sandstone which outcrops in the Powder River district, where it is oil-bearing.

DUGOUT CREEK.—An intermittent stream which flows in a northerly direction through the western portion of the district.

DUTCH CAMP.—Headquarters for the Wyoming Oil Fields Company. Section 24, T. 40 N., R. 79 W.

FIRST FITZHUGH SAND.—The name originally applied to the Wall Creek sand.

SECOND FITZHUGH SAND.—A bed of sandstone about 200 feet below the Wall Creek sand. Reported to be oil-bearing.

HORSE RANCH.—A way station on the Casper road about midway between Casper and the oil fields.

IBA SPRING.—An oil spring or seepage in the bed of Salt Creek, section 13, T. 40 N., R. 79 W.

LITTLE PINE RIDGE.—A ridge of sandstone in the eastern and southern portions of the district, which bears a sparse growth of pine trees and is a land mark in the region.

LITTLE TEAPOT CREEK.—A small intermittent stream which, flowing along the eastern side of the Teapot dome, empties into Teapot Creek in section 21, T. 39, R. 79.

MIDWEST CAMP.—Headquarters in the field for the Midwest Oil Company. Now called Salt Creek post office.

THE NARROWS.—A narrow point in the valley of Teapot Creek where that stream breaks through the escarpment of Parkman sandstone.

PARKMAN SANDSTONE.—A thick bed of massive sandstone which outcrops in the eastern portion of the district.

RAGTOWN.—An abandoned camp of the Wyoming Oil Fields Company. Section 23, T. 40 N., R. 79 W.

SALT CREEK.—The principal stream of the district. The name is derived from the saline character of the water.

SALT CREEK ANTICLINE.—A northwest-southeast trending anticline on which two domes have been developed.

SALT CREEK DOME.—The northernmost of the domes developed on the Salt Creek anticline. Development in the field has been confined to the vicinity of this dome. The name is derived from Salt Creek which, entering the dome on its eastern side, turns northerly and leaves it at its northern extremity.

SALT CREEK POST OFFICE.—The name given to the post office recently established at the Midwest Camp.

SCOTT'S RANCH.—A ranch on Dugout Creek, section 11, T. 40 N., R. 80 W.

SHANNON.—Wyoming Oil Field Company's headquarters in the northern portion of the field. Named for M. P. Shannon who drilled the first well in the district.

SHANNON SAND.—The sandstone from which the heavier oil is obtained in the northern portion of the field. The outcrop of this sandstone completely encircles the Salt Creek dome.

SHERWOOD CREEK.—An intermittent stream flowing westerly and emptying into Salt Creek about one-half mile north of Shannon.

TEAPOT CREEK.—An intermittent stream which, flowing in a northeasterly direction, crosses the Salt Creek anticline at the northern end of the Teapot dome and empties into Salt Creek in section 16, T. 39 N., R. 78 W.

TEAPOT DOME.—The southernmost dome developed on the Salt Creek anticline.

TEAPOT ROCK.—An isolated sandstone butte in section 27, T. 38 N., R. 79 W. The name is derived from the shape of the butte, which resembles a teapot.

TISDALE SAND.—The name locally given the oil-bearing Dakota sandstone which underlies but does not outcrop in the district.

WALL CREEK SAND.—The sandstone from which the lighter oils are obtained. The name is derived from Wall Creek, a small stream west of the Salt Creek district, near which the sandstone outcrops.

TOPOGRAPHY.

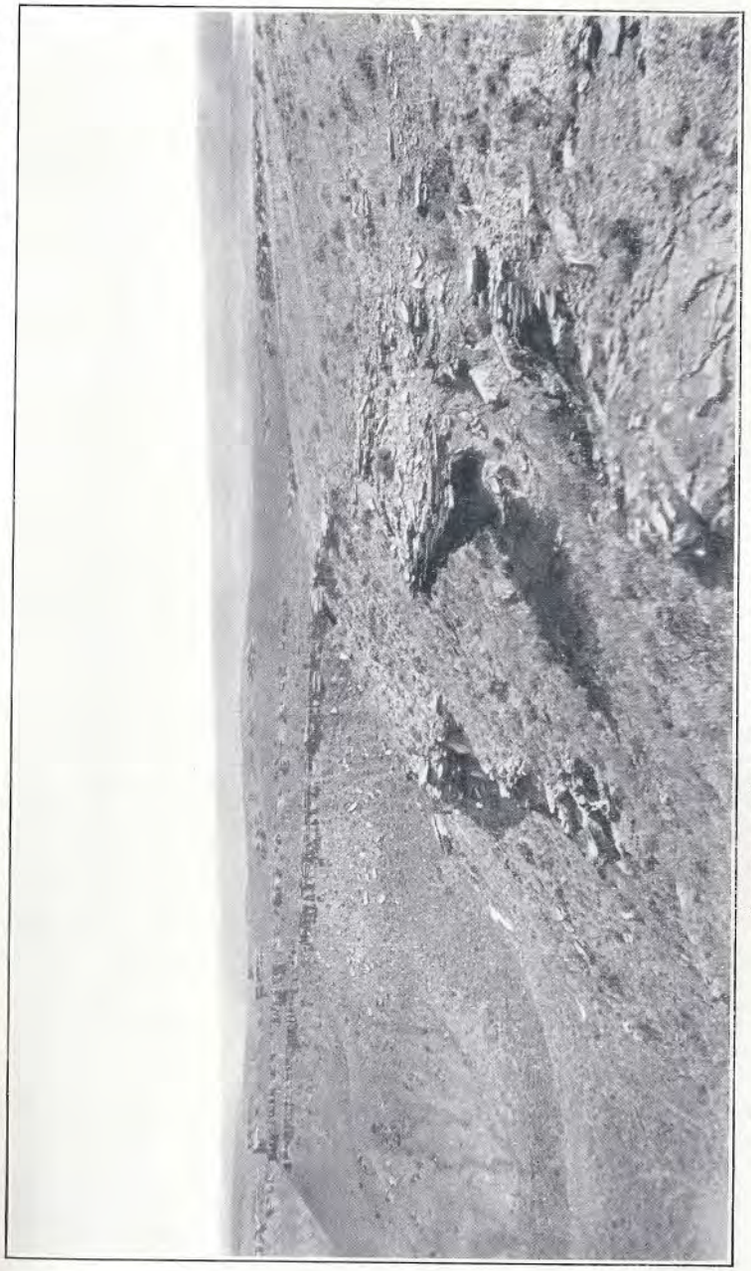
The Salt Creek district in general is treeless and barren. The surface is occupied, in the greater part, by shales of the Pierre formation, forming characteristic rolling hills. The developed field is roughly outlined by the outcrop of the Shannon sandstone, which forms a bold escarpment from 30 to 170 feet in height. Some four miles west of the proven territory the Shannon sandstone again outcrops in a series of bold cliffs, west of which is the broad valley of Dugout Creek. East of the Salt Creek dome are stratigraphically higher beds of sandstone between which short, steep valleys have been developed in the shale.

Salt Creek, a small intermittent stream from which the oil field receives its name, crosses the field from southeast to northwest, receiving several small tributaries, the more important being Dugout, Castle, and Teapot creeks and Bothwell Draw.

GEOLOGY.

STRATIGRAPHY.

In the Salt Creek district there are no exposures of rocks older than middle Cretaceous, though in the Powder River region, twelve miles west, both marine and fresh-water Jurassic beds are found. The surface in the Salt Creek dome is occupied by Pierre shales, while on Dugout Creek the upper portion of the Benton, the Niobrara, and the lower Pierre are exposed. East of Salt Creek, shales and sandstones of the Pierre, Fox Hills and over-lying formations appear. The relations and general characteristics of the rocks to be considered in this report are set forth below:



Outcrop of Shannon Sandstone near Dugout Creek.

SYSTEM	GROUP	FORMATION	CHARACTER	THICKNESS	REMARKS
Cretaceous		Laramie	Concretionary buff shales and sandstones.		
	Montana	Fox Hills	Brown and white sandstones and sandy shales.	650	Contains several thin coal beds.
		Pierre	Dark-colored shales with several stone beds, including the Shannon sandstone.	3600 to 3700	Contains several thin coal beds in its upper portion. Yields oil in the northern part of the field.
	Colorado	Niobrara	Gray and brown sandy shales.	700	
		Benton	Dark shale with a number of sandstone beds, including the Wall Creek sandstone.	1680	Yields oil in the central part of the field.
		Dakota	Coarse sandstone and fine conglomerate.	55	Yields oil in the Powder River region.
Jurassic		Morrison	Gray, green and brown shales and sandstones.		Reported to contain oil in the Powder River region.
		Sundance	Greenish gray sandstones and shales with several highly fossiliferous limestone beds.		

JURASSIC SYSTEM.

SUNDANCE FORMATION.

In the bed of a small canyon in the Powder River region is an exposure of gray limestone which contains large numbers of *Belemnites densus*, *Camptonectes bellistriatus*, and other fossils characteristic of the marine Jurassic. Neither the top nor the bottom of the formation is exposed.

MORRISON FORMATION.

Above the Sundance formation is a series of gray, green, and maroon shales with several sandstone beds. No fossils were obtained from the formation but it is believed to represent the fresh-water Jurassic. The formation is reported by Wegemann* to contain oil in some of the sandstone beds.

CRETACEOUS SYSTEM.

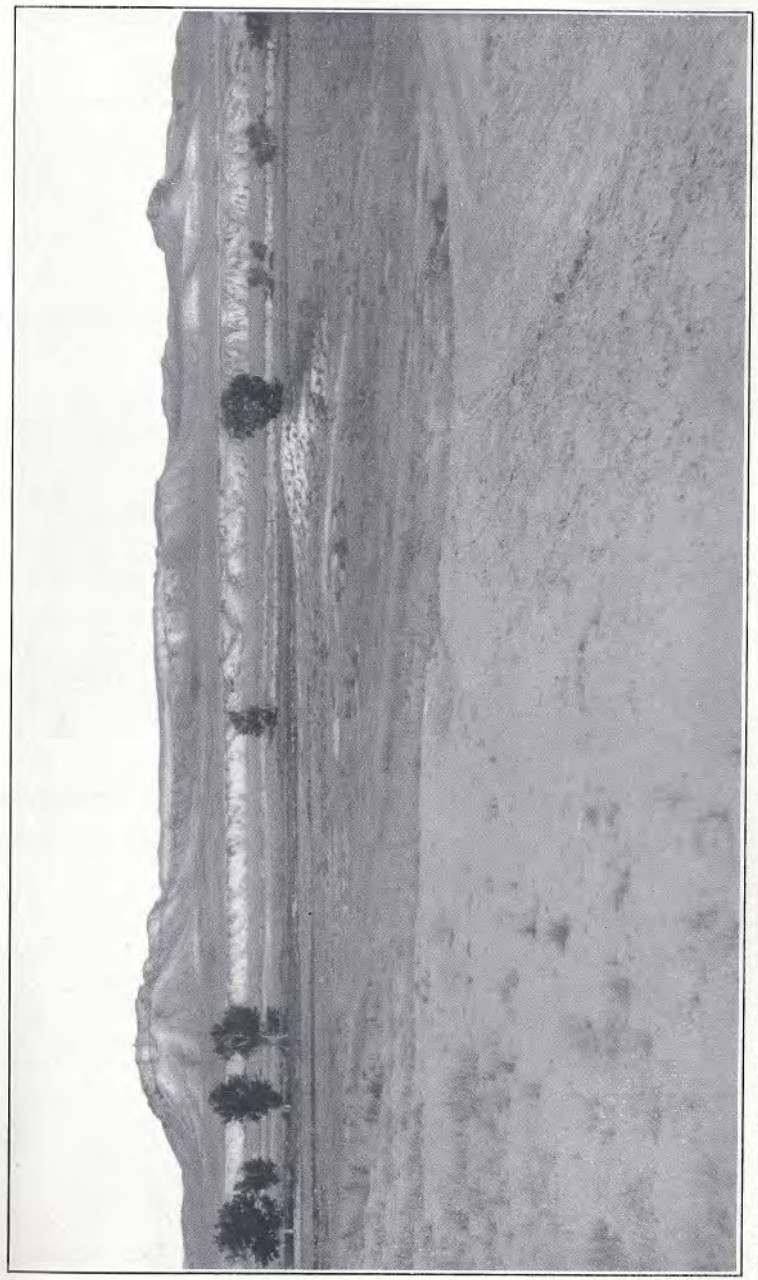
DAKOTA SANDSTONE.

Overlying the Morrison formation in apparent conformity is a bed of coarse-grained sandstone and conglomerate, 55 feet thick, which is provisionally referred to the Dakota. The lower portion of the sandstone is saturated with oil at many points in the Powder River district.

BENTON FORMATION.

Within the Salt Creek dome the Benton formation does not appear at the surface, but farther west, in the

*Wegemann, C. H., The Salt Creek Oil Field. U. S. Geol. Survey Bulletin No. 452, p. 46.



View of the Northeastern Portion of the Field, Showing Salt Creek and the Outcrop of the Shannon Sandstone.

Powder River field, excellent exposures are found. At the base, resting conformably upon the Dakota sandstone, are 85 feet of dark gray shales overlain by a buff, ripple-marked sandstone member 14 feet in thickness. Next above are 157 feet of gray shales with numerous thin sandstone beds, followed by 12 feet of white to buff sandstone containing petrified wood, overlain by 315 feet of thin fissile shales which contain large numbers of fish scales—the Mowry beds. These shales weather white and usually form a conspicuous ridge. Above the Mowry shales are three to five feet of bentonite, followed by 190 feet of dark gray shales, overlain by a bed of gray to buff slabby sandstone, 12 feet in thickness. Next above are 195 feet of dark shales with a bed of buff slabby sandstone in the upper portion. Overlying these shales are 34 feet of buff slabby sandstone, somewhat massive in its upper part, followed by 100 feet of gray shales. Above this series of shales and sandstones is a prominent bed of white to buff cross-bedded sandstone, 45 feet thick. The upper eight inches of this sandstone is composed almost entirely of rounded pebbles one-eighth to one-half inch in diameter. Overlying this member are 220 feet of dark colored shales followed by a bed of sandstone, buff, brown, and gray, ripple-marked and cross-bedded, varying in texture from fine to rather coarse grained—the Wall Creek sandstone. The thickness of this sandstone varies considerably, measurements ranging from 68 to 114 feet, the average of all measurements being 92 feet. Above the Wall Creek sandstone are dark shales extending to the base of the Niobrara formation. The total thickness of the Benton formation as measured west of Dugout Creek is about 1680 feet.

85
14
157
12
315 Mowry
5
190
12
195
34
100
45
220
1384
90
206
1680

FOSSILS.

The following-named fossils were collected from the Benton formation, the fauna as a whole being characteristic of the Colorado group:

Upper portion of Mowry beds:
Inoceramus labiatus, Schlotheim
Gryphaea newberryi, Stanton
Fish scales

Sandstone 200 feet above the Mowry beds:
Inoceramus labiatus, Schlotheim
Inoceramus fragilis, Hall & Meek
Inoceramus dimidius, White
Modiola (Brachydontes) multilinigera, Meek
Barbatia micronema, Meek
Turritella whitei, Stanton
Prionotropis woolgari, Mantell

Sandstone 200 feet below Wall Creek sandstone:
Inoceramus fragilis, Hall and Meek
Avicula gastrodes, Meek
Pharella? pealei, Meek
Rostellites dalli, Meek
Prionocyclus wyomingensis, Meek

Shale below Wall Creek sandstone:
Inoceramus labiatus, Schlotheim
Scaphites ventricosus, M. & H.
Metoicoceras whitei, Hyatt

Wall Creek sandstone:
Inoceramus labiatus, Schlotheim
Cardium pauperculum, Meek?
Mactra emmonsi, Meek
Mactra huerfanensis, Stanton?
Avicula sp.
Gyrodes depressa, Meek
Amaropsis bulbiformis, Sowerby
Fasciolaria (Cryptorhytis) utahensis, Meek
Pyropsis coloradoensis, Stanton?
Rostellites ambigua, Stanton

Shales above Wall Creek sandstone:
Inoceramus simpsoni, Meek
Inoceramus deformis, Meek
Anomia propatoris, White
Trigonarca obliqua, Meek
Crassatella excavata, Stanton
Cyrena carletoni, Meek
Cyrena aequilateralis, Meek
Veniella mortoni, M. & H.

Donax? oblonga, Stanton?
Ostrea, several sp.
Liopistha (Psilomya) concentrica, Stanton
Turritella whitei, Stanton
Helicoceras pariense, White
Metoicoceras whitei, Hyatt
Baculites asper, Morton
Buchiceras swallovi, Shumard
Scaphites vermiformis, M. & H.
Scaphites warreni, M. & H.
Scaphites ventricosus, M. & H.

NIOBRARA FORMATION.

In the valley of Dugout Creek the Niobrara formation is partly concealed and neither the upper nor the lower limits of the formation could be definitely determined. About 210 feet above the Wall Creek sandstone is an exposure of gray, sandy shale in which were found remains of *Ostrea congesta* and two species of *Inocerami*. The formation as a whole is composed of sandy shales, lighter in color than those of the Benton formation, with, in the upper portion, several thin beds of calcareous sandstone and shale. The upper limit of the formation is here placed at the outcrop of a thin bed of hard calcareous sandstone, about 900 feet above the Wall Creek sandstone. Below this point *Ostrea congesta* are rather abundant while above it none were found. The entire thickness of the formation, assuming that the calcareous sandstone marks the top of the formation, is 700 feet. However, the thickness of the formation may be somewhat greater than this figure as Wegemann* states that a measurement near Scott's ranch, in the valley of Dugout Creek, gave a thickness of 1025 feet.

FOSSILS.

Shells of *Ostrea congesta*, *Inoceramus deformis*, and

* Wegemann, C. H., The Salt Creek Oil Field. U. S. Geol. Survey Bull. No. 452, p. 46.

I. labiatus were found throughout the formation. *Ostrea congesta* is especially typical of the Niobrara formation.

PIERRE FORMATION.

The Pierre formation consists of thick deposits of dark colored shales with a number of sandstone layers in its upper portion and a prominent sandstone bed—the Shannon sandstone—in its middle part. Extending from the top of the Niobrara formation to the base of the Shannon sandstone is a series of dark gray shales. In some parts of the district, 400 feet above the base of the formation, is a thin bed of gray sandstone, finely conglomeratic in its upper portion, containing numerous fish teeth. The Shannon sandstone member, which lies about 1050 feet above the base of the formation, consists of two beds separated by from 40 to 90 feet of softer sandstone and sandy shale. About 200 feet above the Shannon sandstone is a bed of buff sandstone, 30 feet thick, overlain by 900 feet of gray and brown shales. Above these shales is a series of interbedded shales and sandstones with several thin coal beds. Near the base of this series is a thick bed of massive, cross-bedded sandstone—the Parkman member—which usually forms a bold outcrop. The thickness of this member is 160 feet. Above the Parkman sandstone are gray, brown, black, and purple shales with gray sandstones and thin coal beds, the thickness of the group being 480 feet. Overlying this group is a bluish-gray sandstone which varies in thickness from 50 to 90 feet. In its upper part it contains two coal beds from ten inches to three feet thick. The sandstone forms a ridge and usually bears a sparse growth of pine trees from which it derives its name—Little

Wyoming State Geologist. Bulletin 4, Series B. Plate V.

Drilling in the Northern Part of the Field. A Pool of Oil in the Left Foreground.

About 200 feet above the Parkman sandstone:

Ostrea glabra, M. & H.?
Avicula linguiformis, E. & S.
Cardium speciosum, M. & H.
Veniella humilis, M. & H.
Liopistha (Cymella) undata, M. & H.
Fasciolaria (Piestrocheilus) culbertsoni, M. & H.
Scaphites nodosus, Owen
Baculites compressus, Say

About 200 feet above Little Pine Ridge:

Barbatia barbatula, White
Lucina occidentalis, Morton
Dosiniopsis nebrascensis, M. & H.
Actaeon attenuatus, M. & H.
Scaphites nodosus, Owen
Baculites compressus, Say

FOX HILLS SANDSTONE.

At the base of the Fox Hills formation is a bed of buff, resistant sandstone, 100 feet thick, overlain by a series of gray and brown shales and shaly sandstones. Overlying these shales are 120 feet of gray and white sandstone with several coal beds, one of which is five feet thick. No distinctive line could be drawn between the Pierre and the Fox Hills formations, but the name Fox Hills is here applied to the upper sandstone members with their included sandy shales. The thickness of the formation is about 650 feet.

FOSSILS.

Shells of *Inoceramus simpsoni*, *Cardium speciosum*, *Veniella humilis*, *Liopostha undata*, and *Nucula cancellata* were found in the sandy shales of the middle portion of the group. These forms are common to both the Pierre and Fox Hills formations.

LARAMIE FORMATION.

Above the Fox Hills sandstone, and extending beyond the eastern limits of the area, is a series of shales and sand-

Bulletin 4, Series B. Plate VI.

B. The Same Well after the Fire was Extinguished.

A. A Burning Oil Well. Well No. F-20.

Wyoming State Geologist.

stones with thin coal beds, known in Wyoming as the "Ceratops beds". These beds have been studied by Hatcher* and by Stanton and Knowlton** in the region lying east of the Salt Creek district, and on paleontological and stratigraphical evidence have been shown by them to be of Laramie age.

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. The axis of this dome lies much nearer its western than its eastern side, dips ranging

*Hatcher, J. B., Ceratops beds of Converse County, Wyoming. Am. Jour. Science, 3rd series. Vol. 45, pp. 112-120. 1893.

**Stanton, T. W. and Knowlton, F. H., Stratigraphy and paleontology of the Laramie and related formations of Wyoming. Bulletin Geol. Soc. America, Vol. 8, pp. 127-156. 1897.

from 14° to 29° on the west and from 5° to 11° on the east. 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. At its northern end the dome narrows abruptly, and just south of Shannon a small structural terrace has been formed. (Section E—F, Plate 18).

Faults were noted 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 six 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.

But one fault was noted in the central part of the dome —that mapped as crossing sections 35 and 36, Township 40 north, Range 79 west. This fault can be readily traced across parts of these sections by the thin band of selenite which has formed along the fracture.

A fault is mapped as occurring in sections 11 and 12, Township 39 north, Range 79 west. This fault was not

noted on the surface but its position was inferred from the position of the Shannon sandstone and the depth to the Wall Creek sandstone in well No. E-2. (Section E—F, Plate 18). In the preparation of that section the Shannon sandstone was drawn in its known position with its known dips and the Wall Creek sandstone was platted at its known distance below the Shannon sandstone. Well No. E-2 was then located at its proper point and its known depth to the Wall Creek sandstone was platted. It was then seen that it was impossible to properly space the Wall Creek sandstone below the Shannon sandstone unless a fault or sharp bend in the strata was introduced. Although a fault is indicated on the map at this point it is not impossible that a terrace has been developed similar to that mentioned as occurring south of Shannon.

In much the same way the displacement due to faulting in sections 35 and 36, Township 40 north, Range 79 west, was determined. The displacement could not be determined on the surface but the logs of the adjacent wells were taken and the movement as shown by the logs of the wells was platted.

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

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

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.

OIL-BEARING SANDSTONES.

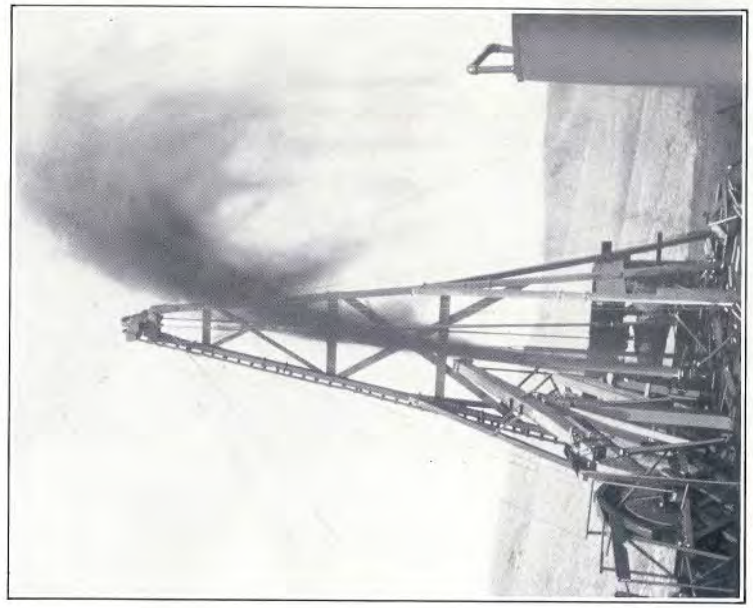
THE SHANNON SANDSTONE.

The outcrop of the Shannon sandstone completely encircles the Salt Creek dome, disappears beneath the surface in the Teapot dome and the Bothwell syncline, and again outcrops, forming a prominent ridge, along the western border of Township 40 north, Range 79 west. While the sandstone varies considerably in both thickness and character, from place to place, it consists as a rule of two hard sandstone members, each about 50 feet thick, separated by a softer sandstone about 50 feet thick.

In section 30, Township 40 north, Range 78 west, the following section was measured:

Sandstone, buff and gray, partly cross-bedded, with harder dark brown layers in its upper part	82 feet
Sandstone, yellow and buff, soft. Contains a number of thin shale beds	25 feet
Sandstone, gray and buff. Lower part massive. Contains occasional cherty conglomeratic beds one to two inches thick. Underlain by blue and gray sandy shales	32 feet
	139 feet

Bulletin 4, Series B. Plate VII.



B. Well No. F-6, Section 26, T. 40, N. R. 79 W.

A. Well No. F-4, Section 26, T. 40 N., R. 79 W.

Wyoming State Geologist.

Section measured in Section 36, Township 40 north, Range 80 west:

Sandstone, buff, coarse-grained, soft	9 feet
Shale, sandy, gray	4 feet
Sandstone, gray and yellow, fine-grained	73 feet
Sandstone, buff, soft, with several shale beds	42 feet
Sandstone, gray, hard	6 feet
Sandstone, bluish gray, coarse-grained, soft	24 feet
Sandstone, coarse-grained, hard	8 feet
	166 feet

The records of the wells drilled near Shannon show the Shannon sand to consist of two sandstones separated by from 30 to 50 feet of softer material. The upper sandstone usually contains water while the oil is obtained in the lower member.

Indications of oil are found in the Shannon sandstone near the center of section 11, T. 40, R. 79; in the northwest quarter of section 12, T. 40, R. 79; and in sections 19, 30, and 31, T. 41, R. 79. In the northwest quarter of section 30, Township 41 north, Range 79 west, the lower portion of the Shannon sandstone is exposed. It is there rather coarse-grained and saturated with oil. A short distance south of this outcrop water impregnated with sulphur issues from the sandstone along a fault plane. Oil-saturated sandstone is exposed at intervals along the outcrop of the Shannon sandstone through a distance of three-fourths mile north and one and one-half miles south of the above-mentioned locality.

THE WALL CREEK SANDSTONE.

The Wall Creek sandstone outcrops in the extreme western portion of the district in a series of bold cliffs, forming the wall from which Wall Creek derives its name.

No indications of oil were noted in the outcrop of the Wall Creek sandstone. In the southwest quarter of section 16, Township 40 north, Range 80 west, a well was drilled some years ago, reaching the Wall Creek sandstone at a depth of 160 feet. A showing of oil and a small amount of gas are reported to have been obtained from that sandstone.

Section of Wall Creek sandstone measured in section 19, Township 40 north, Range 80 west:

Sandstone, buff, slabby	15 feet
Sandstone, gray and buff, coarse-grained, massive	78 feet
Sandstone, buff, slabby, ripple-marked, with several beds of harder brown sandstone. Underlain by gray shale	21 feet
	114 feet

Section measured in section 6, Township 40 north, Range 80 west:

Sandstone, yellow, slabby	32 feet
Sandstone, brown, fine-grained, hard	12 feet
Sandstone, buff, fine-grained, cross-bedded. Underlain by dark shales	34 feet
	78 feet

In the Salt Creek dome the Wall Creek sandstone is not exposed but it is reached by many of the wells drilled in the central portion of the dome, and is the most productive sand of the region. Although as a whole it is somewhat fine grained, as exhibited in its outcrop near Wall Creek, it varies considerably in texture, as shown by the records of the wells drilled in the Salt Creek dome. The drillings obtained from the sand in well No. F-18, southwest quarter of section 13, T. 40 N., R. 79 W., consisted almost entirely of rounded pebbles from one-eighth to one-half inch in diameter. The Wall Creek sandstone was formerly known

as the "First Fitzhugh Sand", the name Wall Creek having been applied by Wegemann*.

The indications of oil in a sandstone lower than the Shannon sand, which led to the drilling of wells in the central portion of the dome, consist of numerous oil seeps and springs. The largest and most important of these was the Iba spring, in the bed of Salt Creek, southwest quarter of section 13, Township 40 north, Range 79 west. At the present time the bed of Salt Creek contains more or less oil throughout its course in the field, due to the oil wasted when the "gusher" wells are brought in, and the exact location of the Iba spring cannot be determined.

THE SECOND FITZHUGH SANDSTONE.

Underlying the Wall Creek sandstone are 220 feet of shales, beneath which are 45 feet of sandstone, white, gray, and buff in color, slabby near the top and cross-bedded in the lower portion. The upper eight inches of this member is composed almost entirely of hard black pebbles from one-eighth to one-half inch in diameter. This sandstone has been reported to be oil-bearing, but no indications of oil were noted in its outcrop. None of the wells drilled in the Salt Creek dome have reached this sandstone.

DAKOTA SANDSTONE.

Although the Dakota sandstone is not exposed at the surface in the Salt Creek district it can probably be reached with wells from 2400 to 3600 feet deep. In the Powder River region, where it is well exposed, the Dakota sandstone consists of gray to buff coarse-grained sandstone and con-

*U. S. Geol. Survey Bulletin No. 452.

glomerate, some of the individual pebbles measuring one inch in diameter. The sandstone is saturated with oil at many points, though in some, if not all, cases the oil is accompanied by water impregnated with sulphur. The thickness of the Dakota sandstone is 55 feet.

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 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 was 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

B. WELL NO. M-14, SECTION 24, T. 40 N., R. 79 W.

A. WELL NO. M-7, SECTION 13, T. 40 N., R. 79 W.

but no discoveries of oil had been made. In 1906 Dr. Casare 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 and, considering the data then available, outlined the productive portion of the field with remarkable accuracy. 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 Com-

pany. Since 1910 development has been rapidly carried on and there are now more than 100 producing wells in the field.

A well, which is of some importance as indicating the possibility of obtaining oil in the western portion of the district, was drilled about 1895 in section 16, township 40 north, range 80 west, near Dugout Creek. The well passed through the Wall Creek sandstone, the productive sand of the Salt Creek dome, at about 200 feet, obtaining a small showing of oil and sufficient gas to burn with a flame six inches in length. The well was continued to a depth of about 1200 feet, obtaining an artesian flow of lukewarm water, slightly impregnated with sulphur.

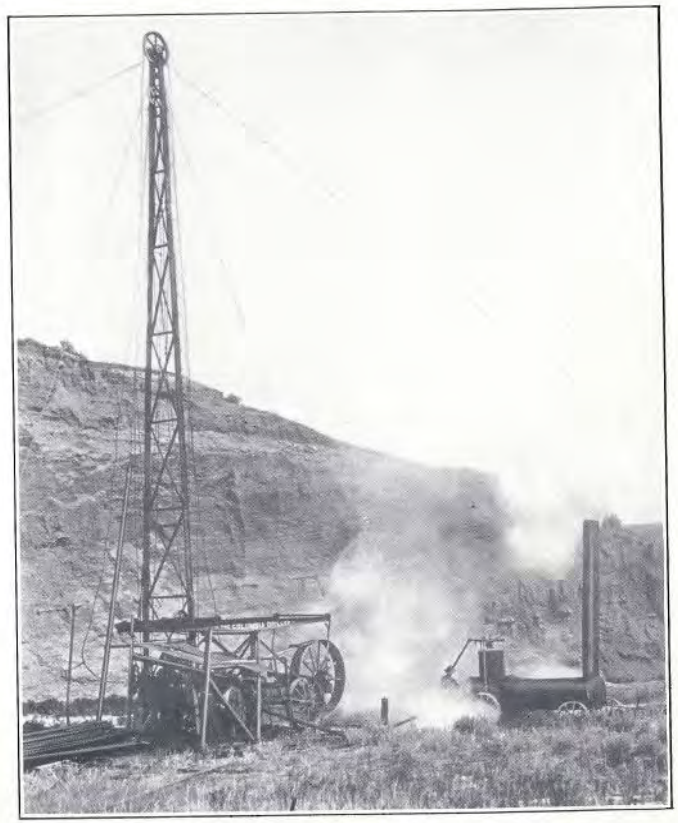
A large area which had been classified as mineral land was withdrawn from entry of all kinds in 1909. Upon reclassification all lands except those mentioned below were restored to entry, June 25, 1910. The withdrawal of these lands has resulted in a large amount of litigation and has greatly retarded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

LANDS WITHDRAWN FROM ENTRY.

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; SE ¼ 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.

A. GENERAL VIEW OF THE SHANNON DISTRICT, SALT CREEK IN THE FOREGROUND.



B. DRILLING IN THE SHANNON DISTRICT. SHALES OF THE UPPER PIERRE IN THE BACKGROUND.

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 28: All;
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; 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.

OIL COMPANIES.

The companies named below are operating in the Salt Creek district at the present time:

CASPER-WYOMING OIL COMPANY.

OFFICES.—Denver, Colo., and Casper, Wyoming.
PRESIDENT.—Oliver L. Brown.
SECRETARY.—S. V. Hageman.

DIRECTORS.—Joe F. Wallace, Oliver L. Brown, A. L. Johnston, S. V. Hageman, L. B. Riddle.
INCORPORATED.—Under the laws of Wyoming, 1912.
AUTHORIZED CAPITAL.—$750.000.

This company, recently organized, is preparing to begin operations in the Dugout Creek district, where it has secured control of 640 acres.

ECLIPSE OIL COMPANY.

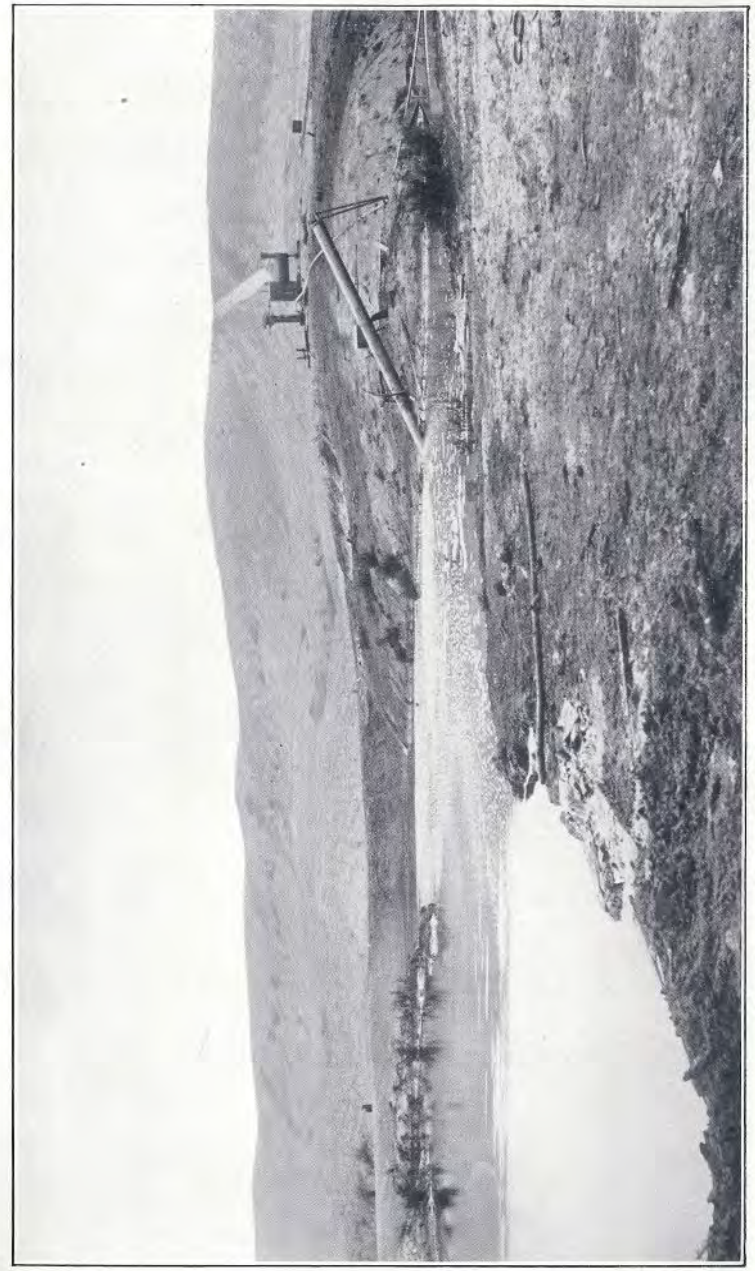
OFFICES.—Casper, Wyoming and Denver, Colorado.
PRESIDENT.—J. Condit Smith.
VICE PRESIDENT.—M. B. Burke.
SECRETARY.—S. S. Doty.
DIRECTORS.—J. Condit Smith, H. C. Perrine, C. A. Read, Jr., M. B. Burke, S. S. Doty.
SUPERINTENDENT.—W. P. DeLaat.
INCORPORATED.—Under the laws of Colorado, 1912.
AUTHORIZED CAPITAL.—$1,500,000.

The Eclipse Oil Company has drilled five wells, obtaining oil in three. Four wells are now being drilled.

FRANCO-WYOMING OIL COMPANY.

OFFICES.—Casper, Wyoming, and Paris, France.
PRESIDENT.—H. Foulon de Vaulx.
VICE PRESIDENT.—P. E. Caplane.
SECRETARY.—W. D. Attrill.
DIRECTORS.—Count de Brouville, Douglas Read, Count de Chazouliere, C. de Ryck, K. Ledeboer, C. Virdin, Henry Bouree.
INCORPORATED.—Under the laws of Delaware, 1910.
AUTHORIZED CAPITAL.—$6,500,000.

The operations of this company will be described under the Wyoming Oil Fields Company, of which it is a subsidiary.



THE PORRO WELL, SHOWING LAKE OF OIL. SECTION 23, T. 40 N., R. 79 W.

HANLEY AND BRADLEY.

This company, which is not incorporated, consists of Wm. Hanley of Bradford, Pa., and J. B. Bradley of Casper, Wyoming. One well has been drilled in the northeast corner of section 3, township 39 north, range 79 west. Oil was obtained at a depth of 1330 feet.

HJORTH OIL COMPANY.

Wm. Hjorth and associates of Jamestown, New York, operate in the Salt Creek district under the name of the Hjorth Oil Company which is not incorporated. An oil well was recently brought in at a depth of 1560 feet in the northwest quarter of section 33, township 40 north, range 79 west.

PRESIDENT.—F. U. Stranberg.
VICE PRESIDENT.—Andrew Wallin.
SECRETARY AND TREASURER.—Wm. Hjorth.
CAPITAL.—$100,000.
OFFICES.—Casper, Wyoming.

LUCKY STRIKE OIL COMPANY.

OFFICES.—Casper, Wyoming.
PRESIDENT.—Patrick Sullivan.
SECRETARY.—H. L. Patton.
DIRECTORS.—Patrick Sullivan, H. L. Patton, E. O. Orchard.
INCORPORATED.—Under the laws of Wyoming, 1911.
AUTHORIZED CAPITAL.—$1,500,000

A well is being drilled on section 16, township 39 north, range 79 west, the last reported depth being 1835 feet. Contracts for drilling three additional wells have been let.

MIDWEST OIL COMPANY.

OFFICES.—Casper, Wyoming, Denver, Colo., Colorado Springs, Colo., Paris, France.
PRESIDENT.—O. H. Shoup.
VICE PRESIDENTS.—K. C. Schuyler, B. H. Hopkins.
SECRETARY.—J. L. Warren.
GENERAL MANAGER.—R. D. Brooks.
TRAFFIC MANAGER.—H. G. Naylor.
SUPERINTENDENT.—N. S. Wilson.
REFINERY SUPERINTENDENT.—Wm Deitrich.
CASHIER.—Wm. C. Prescott.
DIRECTORS.—O. H. Shoup, K. C. Schuyler, R. D. Brooks, B. H. Hopkins, H. G. Naylor, N. S. Wilson, W. F. Schuyler, C. A. Fisher, C. C. Hamlin, J. S. Warren, F. J. Sisman, E. T. Delanone, H. Ballencourt, J. Bartholoni, B. Dagny.
INCORPORATED.—Under the laws of Arizona, 1911.
AUTHORIZED CAPITAL.—$6,000,000.

The Midwest Company, which entered the field in 1910, has erected a refinery at Casper, laid a six-inch pipe line from Casper to the Salt Creek field, and has drilled 46 wells. The company is now selling, through the established marketing concerns, gasoline, kerosene, gas, oil and distillates. The residuum left after refining is sold to the railroads and other consumers of fuel oil. At present the company is producing and refining from 4000 to 5000 barrels of oil per day.

NATRONA PIPE LINE AND REFINERY COMPANY.

OFFICES.—Casper, Wyoming.
PRESIDENT.—W. D. Waltman.
VICE PRESIDENT.—P. E. Caplane.
MANAGER.—H. S. Winans.

INCORPORATED.—Under the laws of Wyoming, 1911.
AUTHORIZED CAPITAL.—$1,000,000.

This company, a subsidiary of the Wyoming Oil Fields Company, has erected a refinery on the eastern outskirts of Casper and has laid a six-inch pipe line to the field. The refinery of four stills, daily capacity 1200 barrels, produces gasoline, benzine, kerosene, distillate, fuel oil, and various lubricating oils. The products are marketed through the Texas Oil Company. The capacity of the refinery is to be increased to 3000 barrels per day before the first of March, 1913.

NORTHWESTERN OIL COMPANY.

OFFICES.—Casper, Wyo., and Denver, Colo.
PRESIDENT.—J. D. Hawkins.
VICE PRESIDENT.—T. B. Stearns.
SECRETARY.—A. G. Hopkins.
MANAGER.—A. G. Hopkins.
SUPERINTENDENT.—R. B. Morrison.
DIRECTORS.—J. D. Hawkins, T. B. Stearns, Bert Stearns, Lee Champion, A. G. Hopkins.
INCORPORATED.—Under the laws of Colorado, 1912.
AUTHORIZED CAPITAL.—$500,000.

The Northwestern Company has drilled four wells in the Salt Creek field, obtaining oil in three. Two wells are now being drilled.

SALT CREEK OIL FIELDS COMPANY.

OFFICES.—Casper, Wyoming.
PRESIDENT.—W. A. Johnson.
VICE PRESIDENT.—R. D. Tyler.
SECRETARY.—R. H. Nichols.
MANAGER.—R. H. Nichols.

DIRECTORS.—R. D. Tyler, J. T. Macey, R. H. Nichols, M. S. Price, W. Johnson.
INCORPORATED.—Under the laws of Wyoming, 1912.
AUTHORIZED CAPITAL.—$1,000,000.

No wells have as yet been drilled by this company which was recently organized. Its holdings consist of about 2000 acres in the Dugout Creek district, west of the Salt Creek dome.

WYOMING CRUDE OIL COMPANY.

OFFICES.—Casper, Wyoming.
DIRECTORS.—N. S. Wilson, Elmer Green, R. B. Morrison, J. R. Dunbar.
INCORPORATED.—Under the laws of Wyoming, 1912.
AUTHORIZED CAPITAL.—$500,000.

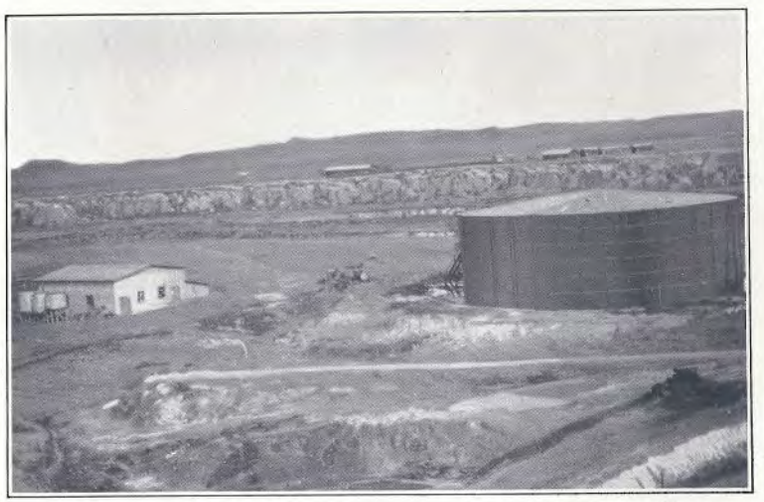
This company is now drilling in the northeast corner of section 28, township 40 north, range 79 west, the last reported depth being 1140 feet.

WYOMING OIL FIELDS COMPANY.

OFFICES.—Casper, Wyoming.
PRESIDENT.—Otto Gramm.
VICE PRESIDENT.—W. D. Waltman.
MANAGER.—W. D. Waltman.
SUPERINTENDENT.—S. A. Lane.
DIRECTORS.—Otto Gramm, W. D. Waltman, A. W. Barber, Wallace Bond, Wm. Dubois, A. C. Campbell, A. C. Mason.
INCORPORATED.—Under the laws of Wyoming, 1912.
AUTHORIZED CAPITAL.—$8,000,000.

The Wyoming Oil Fields Company entered the field in 1911, taking over the holdings of the Ascos Company, the Petroleum Maatschappij Salt Creek, the Belgo Com-

A. BURNING WASTE OIL IN THE SALT CREEK FIELD.



B. VIEW OF THE EASTERN PART OF THE FIELD NEAR DUTCH CAMP.

pany, the Franco-Wyoming Oil Company, and other operators. Through its subsidiary, the Natrona Pipe Line and Refinery Company, it has laid a six-inch pipe line from Casper to the field and owns and operates a refinery at Casper. This company and its predecessors have drilled 58 wells in the field, obtaining oil in 51.

WELLS.

A list of the wells drilled in the Salt Creek district is given in the following table:

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 & 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. It now produces about 750 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 in 1912.

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-2. Eclipse Oil Company. Northeast corner of southeast quarter of section 3, T. 39 N., R. 79 W. 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 southwest quarter of section 12, T. 39 N., R. 79 W. 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, T. 39 N., R. 79 W. Water was encountered at 1550 feet and the well was abandoned. Drilled in 1912.

Well No. E-5. Eclipse Oil Company. Southwest corner of the northwest quarter of section 12, T. 39 N., R. 79 W. 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 1912.

Well No. E-6. Eclipse Oil Company. Northwest corner of northwest quarter of section 11, T. 39 N., R. 79 W. Drilling.

Well No. E-7. Eclipse Oil Company. Northeast quarter of section 9, T. 39 N., R. 79 W. Drilling.

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

Well No. 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 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. Present production 150 barrels. Drilled 1908. The first well drilled in the Salt Creek district. The well was not drilled into the sand until 1912.

Well No. F-2. Wyoming Oil Fields Company. Southeast quarter of section 23, T. 40 N., R. 79 W. 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.

Well No. F-3. Wyoming Oil Fields Company. Southwest quarter of section 24, T. 40 N., R. 79 W. 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.

Well No. F-4. Wyoming Oil Fields Company. Northeast corner of northeast quarter of section 26, T. 40 N., R. 79 W. Elevation at top of casing 4920 feet. Depth to Wall Creek sand 1030 feet. Total depth 1080 feet. Initial production 200 barrels. Present production 130 barrels. Drilled 1910.

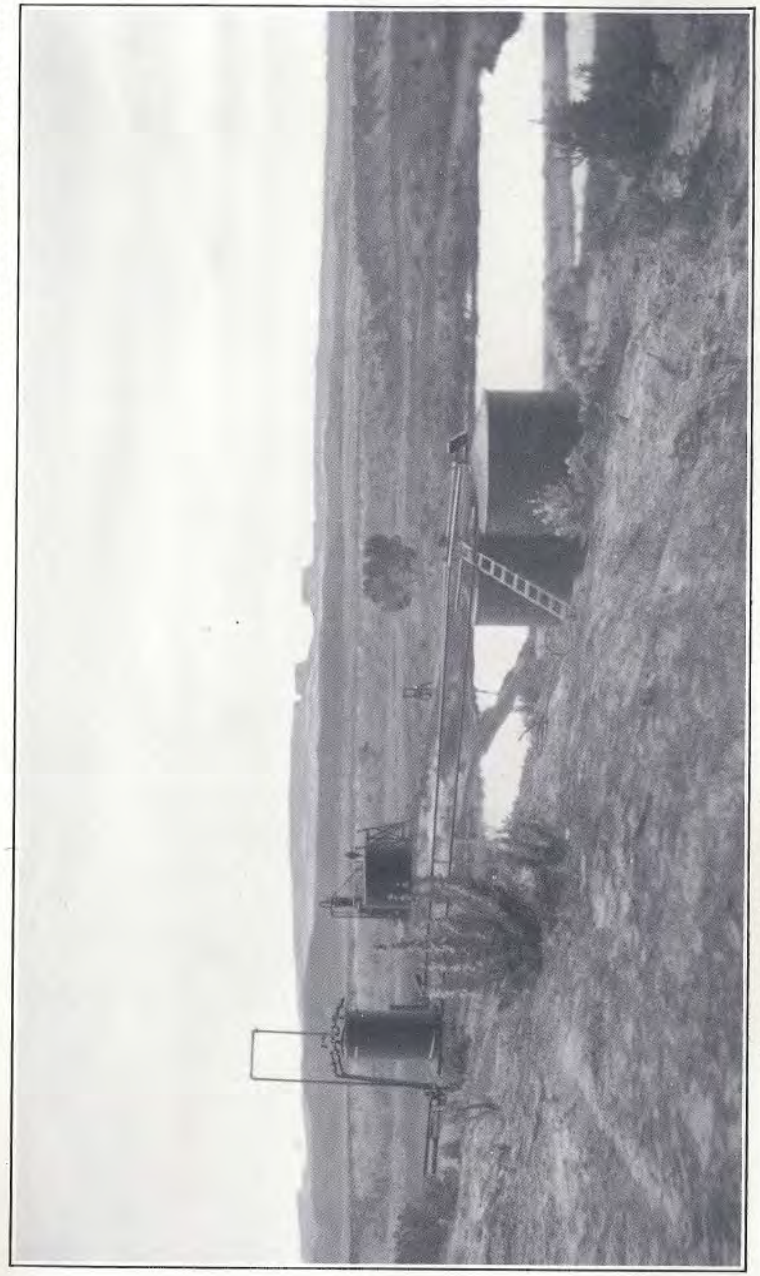
Well No. F-5. Wyoming Oil Fields Company. Southwest quarter of southwest quarter of section 13, T. 40 N., R. 79 W. Elevation at top of casing 4893 feet. Total depth 175 feet. Reported to produce 10 barrels of oil per day. Drilled 1910.

Well No. F-6. Wyoming Oil Fields Company. Southeast quarter of northwest quarter of section 26, T. 40 N., R. 79 W. Elevation at top of casing 4987 feet. Depth to Wall Creek sand 1000 feet. Total depth 1010 feet. Initial production 600 barrels. Present production 130 barrels. Drilled 1910.

Well No. F-7. Wyoming Oil Fields Company. Southwest corner of southwest quarter of section 18, T. 40 N., R. 78 W. 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-8. Wyoming Oil Fields Company. Southwest corner of southwest quarter of section 19, T. 40 N., R. 78 W. 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.

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



View of the Southern Portion of the Field. Castle Rock in the Background.

feet. Total depth 910 feet. The Wall Creek sandstone has not been reached. Initial production 75 barrels. Present production 25 barrels. Drilled 1911.

Well No. F-10. Wyoming Oil Fields Company. Northwest quarter of section 30, T. 40 N., R. 78 W. Elevation at top of casing (barometric) 4905 feet. Total depth 1186 feet. The Wall Creek sandstone has not been reached. Initial production 250 barrels. Present production 50 barrels. Drilled 1911.

Well No. F-13. Wyoming Oil Fields Company. Northeast corner of northeast quarter of section 23, T. 40 N., R. 79 W. Total depth 1200 feet. Elevation at top of casing 4901 feet. Initial production 600 barrels. Present production 330 barrels. Drilled 1911.

Well No. F-14. Wyoming Oil Fields Company. Southwest quarter of section 13, T. 40 N., R. 79 W. Elevation at top of casing 4851 feet. Total depth 1355 feet. Initial production 550 barrels. Present production 200 barrels. Drilled 1911.

Well No. F-15. Wyoming Oil Fields Company. Southwest quarter of section 13, T. 40 N., R. 79 W. 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 Nov. 7, 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 two 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 11, 1911.

Well No. F-16. Wyoming Oil Fields Company. Northwest quarter of northwest quarter of section 24, T. 40 N., R. 79 W. Elevation at top of casing 4869 feet. Depth to Wall Creek sand 1164 feet. Total depth 1204 feet. Initial production 800 barrels. Present production 764 barrels. Drilled 1912.

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. Present production 150 barrels. Drilled 1912.

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.

Well No. F-19. Wyoming Oil Fields Company. Northwest corner of southeast quarter of section 23, T. 40 N., R. 79 W. 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 three to four 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 30, 1912.

Well No. F-20. Wyoming Oil Fields Company. Northwest quarter of southwest quarter of section 23, T. 40 N., R. 79 W. 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.

Well No. F-21. Wyoming Oil Fields Company. Shannon district. 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 has been pumped almost continuously to the present time, producing four barrels of oil per day.

Well No. F-22. Wyoming Oil Fields Company. Shannon district. 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 1090 to 1145 feet.
Shale 1145 to 1160 feet.
Oil sand 1160 to 1180 feet.
Depth of well 1180 feet.
Cased with 6 5-8-inch casing to 1145 feet.
Well completed May 28, 1911.

Well No. F-23. Wyoming Oil Fields Company. Shannon district. Southwest quarter of the southwest quarter of section 31, T. 41 N., R. 78 W. Elevation at top of casing 4970 feet. Production three barrels. The well record follows:

Commenced drilling August 21, 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 1077 feet.
Light sand at 1084 feet.
Shut down October 27, 1895 to April 25, 1898.
Coarse light-colored sand to 1137 feet.
Bottom of well 1137 feet.

Well No. F-24. Wyoming Oil Fields Company. Shannon district. Southwest quarter of southwest quarter of section 31, T. 41 N., R. 78 W. 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. Shannon district. 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 11, 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. Shannon district. Northeast quarter of northwest quarter of section 1, T. 40 N., R. 79 W. Elevation at top of casing 4895 feet. Production seven barrels.

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

Well No. F-27. Wyoming Oil Fields Company. Shannon district. Elevation at top of casing 4792 feet. Northwest quarter of northwest quarter of section 1, T. 40 N., R. 79 W. Production six barrels. Drilled 1892.

Water at 340 and 765 feet.
Oil at 837 feet.
Bottom of good sand at 857 feet.
Bottom of hole at 883 feet.

Well No. F-28. Wyoming Oil Fields Company. Shannon district. Northwest quarter of northwest quarter

of section 1, T. 40 N., R. 79 W. Elevation at top of casing 4793 feet. Production six barrels.

Commenced to drill November 17, 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 20, 1895.

Well No. F-29. Wyoming Oil Fields Company. Shannon district. Northwest quarter of northwest quarter of section 1, T. 40 N., R. 79 W. Elevation at top of casing 4804 feet. Production six barrels.

Commenced drilling March 18, 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 1, 1895.

Well No. F-30. Wyoming Oil Fields Company. Shannon district. Northwest quarter of northwest quarter of section 1, T. 40 N., R. 79 W. Elevation at top of casing 4810 feet. Production seven barrels. Drilled 1902. Total depth 856 feet.

Well No. F-31. Wyoming Oil Fields Company. Shannon district. Northwest quarter of northwest quarter of section 1, T. 40 N., R. 79 W. Elevation at top of casing 4790 feet. Production six barrels.

Commenced drilling May 30, 1902.
Shale to 300 feet.
Sand at 300 feet.
Water at 335 feet.
Sand with water at 720 feet.
Oil at 796 feet.
Bottom of well at 838 feet.
Well completed June 12, 1902.

Well No. F-32. Wyoming Oil Fields Company. Shannon district. Northwest quarter of northwest quarter

of section 1, T. 40 N., R. 79 W. Elevation at top of casing 4815 feet. Production six barrels.

Commenced drilling August 20, 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. Shannon district. Southeast quarter of northwest quarter of section 1, T. 40 N., R. 79 W. 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. Shannon district. Southeast quarter of northwest quarter of section 1, T. 40 N., R. 79 W. Elevation at top of casing 4827 feet. Total depth 978 feet. Production seven barrels. Drilled 1911.

Well No. F-35. Wyoming Oil Fields Company. Shannon district. Southwest quarter of northwest quarter of section 1, T. 40 N., R. 79 W. 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. Shannon district. Southwest quarter of northwest quarter of section 1, T. 40 N., R. 79 W. 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. Shannon district. Northwest quarter of northwest quarter of

section 1, T. 40 N., R. 79 W. 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. Shannon district. Northwest quarter of northwest quarter of section 1, T. 40 N., R. 79 W. 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. Shannon district. Northwest quarter of northwest quarter of section 1, T. 40 N., R. 79 W. 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. Shannon district. Northwest quarter of northwest quarter of section 1, T. 40 N., R. 79 W. 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. Shannon district. 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. Shannon district. 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. Shannon district. Northeast quarter of northwest quarter of section 1, T. 40 N., R. 79 W. 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 989 feet.

Well No. F-44. Wyoming Oil Fields Company. Shannon district. Northeast quarter of northwest quarter of section 1, T. 40 N., R. 79 W. 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. Shannon district. 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. Shannon district. 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. Shannon district. Southwest quarter of southwest quarter of section 31, T. 41, N., R. 78 W. Elevation at top of casing 4890 feet. Production ten barrels. Depth to sand 965 feet. Total depth 1023 feet. Drilled 1912.

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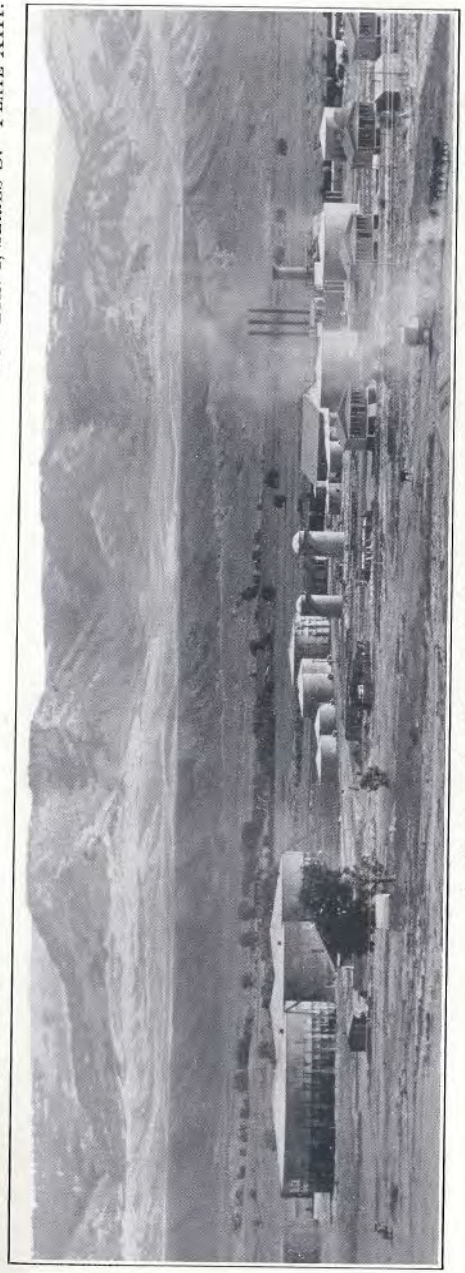
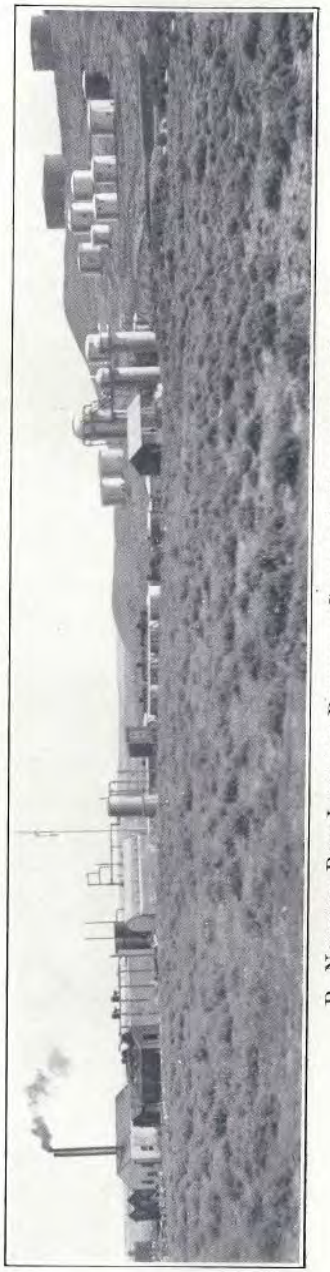


A. Midwest Oil Company's Refinery at Casper.



B. Natrona Pipe Line and Refinery Company's Refinery at Casper.

Well No. F-48. Wyoming Oil Fields Company. Shannon district. 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. Shannon district. 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. Shannon district. Southeast quarter of northeast quarter of section 2, T. 40 N., R. 79 W. Elevation at top of casing 4824 feet. Drilled 1905.

Bottom of first water sand 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. Shannon district. Southeast quarter of northeast quarter of section 2, T. 40 N., R. 79 W. 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. Shannon district. Southeast quarter of northeast quarter of section 2, T. 40 N., R. 79 W. 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 at 800 feet.

Well No. F-53. Wyoming Oil Fields Company. Shannon district. Southeast quarter of northeast quarter of

section 2, T. 40 N., R. 79 W. 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. Shannon district. Southwest quarter of northwest quarter of section 1, T. 40 N., R. 79 W. Elevation at top of casing 4813 feet. Production one-third barrel of oil, one barrel of 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. Shannon district. Southeast quarter of southeast quarter of section 36, T. 41 N., R. 79 W. 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. F-56. Wyoming Oil Fields Company. Shannon district. Northwest quarter of southwest quarter of section 1, T. 40 N., R. 79 W. 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. Shannon district. Southeast quarter of southwest quarter of section 1, T. 40 N., R. 79 W. Elevation at top of casing 4810 feet. The wel 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. Shannon district. Southeast quarter of southwest quarter of section 1, T. 40 N., R. 79 W. 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. Shannon district. 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. Shannon district. 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.

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 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. 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. Elevation at top of casing 4867 feet. Record not available.

Well No. M-2. Midwest Oil Company. Northwest quarter of southwest quarter of section 13, T. 40 N., R. 79 W. 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 28, 1912.

Well No. M-3. Midwest Oil Company. Southwest quarter of section 13, T. 40 N., R. 79 W. Elevation at top of casing 4870 feet. Record not available.

Well No. M-4. Midwest Oil Company, Southwest quarter of section 13, T. 40 N., R. 79 W. 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, T. 40 N., R. 79 W. Elevation at top of casing 4849 feet. Depth to Wall Creek sandstone 1251 feet. Total depth 1301 feet. Initial production 2000 barrels. Present production 1200 barrels.

Well No. M-6. Midwest Oil Company. Southwest quarter of section 13, T. 40 N., R. 79 W. 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, T. 40 N., R. 79 W. 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, T. 40 N., R. 79 W. Depth to Wall Creek sandstone 1187 feet. Total depth 1207. Initial production 250 barrels. Present production 100 barrels.

Well No. M-9. Midwest Oil Company. Southeast quarter of southeast quarter of section 14, T. 40 N., R. 79 W. 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, T. 40 N., R. 79 W. 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-11. Midwest Oil Company. Southwest quarter of northeast quarter of section 25, T. 40 N., R. 79 W. 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-12. Midwest Oil Company. Southwest quarter of northeast quarter of section 25, T. 40 N., R. 79 W. 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, T. 40 N., R. 79 W. 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, T. 40 N., R. 79 W. 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, T. 40 N., R. 79 W. Elevation at top of casing 4896 feet.

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

Well No. M-16. Midwest Oil Company. Southwest quarter of southeast quarter of section 25, T. 40 N., R. 79 W. 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, T. 40 N., R. 79 W. Elevation at top of casing 4921 feet. The log of the well follows:

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

Well No. M-18. Midwest Oil Company. Southeast quarter of southeast quarter of section 26, T. 40 N., R. 79 W. Elevation at top of casing 4932 feet. The record of the well is not available.

Well No. M-19. Midwest Oil Company. Northwest quarter of northwest quarter of section 36, T. 40 N., R. 79 W. Elevation at top of casing 4938 feet.

Commenced drilling February 17, 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 9, 1912.

Well No. M-20. Midwest Oil Company. Northwest quarter of northwest quarter of section 36, T. 40 N., R. 79 W. Elevation at top of casing 4938 feet. Depth to sand 995 feet. Total depth 1075 feet. Drilled 1912.

Well No. M-21. Midwest Oil Company. Northwest quarter of northwest quarter of section 36, T. 40 N., R. 79 W. Elevation at top of casing 4947 feet.

Commenced drilling February 17, 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-22. Midwest Oil Company. Northwest quarter of northwest quarter of section 36, T. 40 N., R. 79 W. 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, T. 40 N., R. 79 W. Elevation at top of casing 4951 feet. Depth to Wall Creek sand 1106 feet. Well not yet drilled into the sand. Drilled 1912.

Well No. M-24. Midwest Oil Company. Northwest quarter of northwest quarter of section 36, T. 40 N., R. 79 W. Elevation at top of casing 4957 feet. Depth to Wall Creek sand 1149 feet. Well not yet drilled into the sand. Drilled 1912.

Well No. M-25. Midwest Oil Company. Southwest quarter of northwest quarter of section 36, T. 40 N., R. 79 W. Elevation at top of casing 4980 feet.

Commenced drilling March 15, 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 30, 1912.

Well No. M-26. Midwest Oil Company. Southwest quarter of northwest quarter of section 36, T. 40 N., R. 79 W. 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.

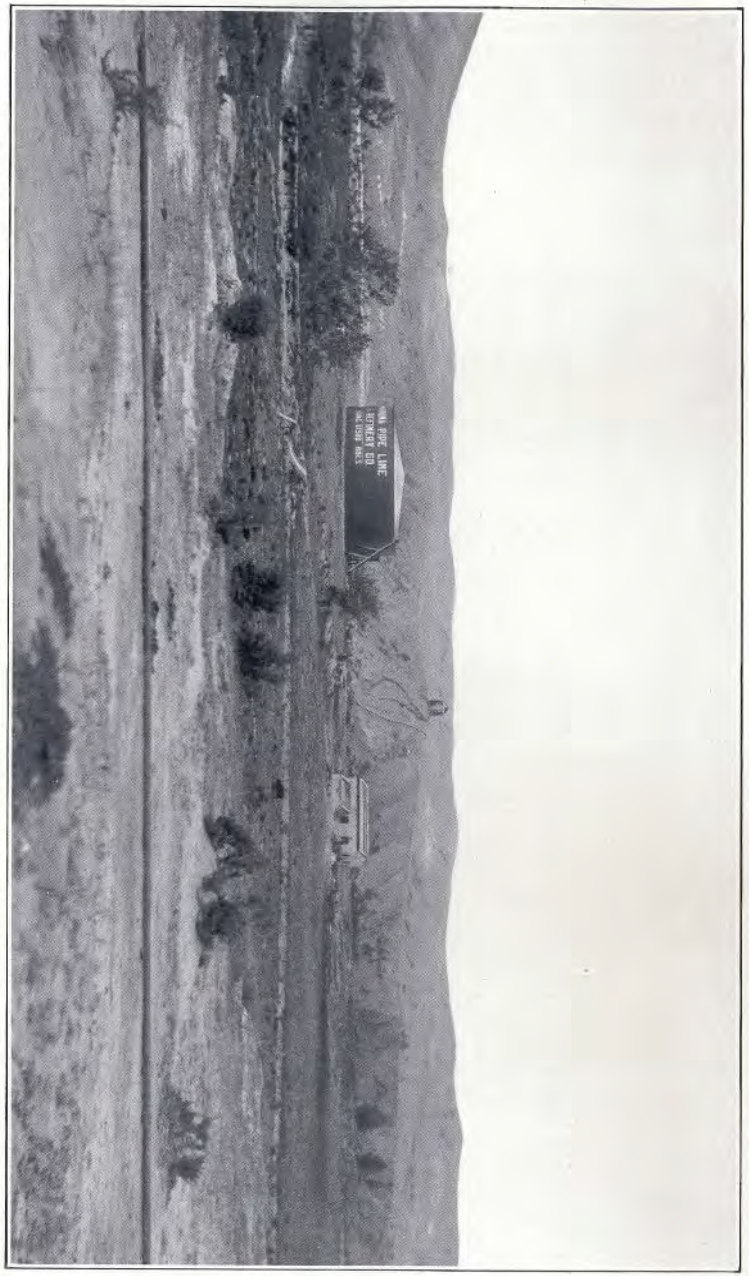
Well No. M-27. Midwest Oil Company. Southwest quarter of southwest quarter of section 36, T. 40 N., R. 79 W. Elevation at top of casing 4972 feet. Depth to Wall Creek sand 1229 feet. Total depth 1279 feet. Initial production 25 barrels. Present production 25 barrels. Drilled 1912.

Well No. M-28. Midwest Oil Company. Southwest quarter of southwest quarter of section 36, T. 40 N., R. 79 W. 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, T. 39 N., R. 79 W. 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, T. 40 N., R. 79 W. 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, T. 39 N., R. 79 W. The well produces oil and water. The record is not available.



VIEW OF THE CENTRAL PORTION OF THE FIELD. THE PORRO WELL (MAP NO. F-2) LIES ABOUT 1000 FEET BEYOND THE SMALL TANK.

Well No. M-32. Midwest Oil Company. Northeast quarter of southwest quarter of section 11, T. 39 N., R. 79 W. 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 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 1912.

Well No. M-35. Midwest Oil Company. Northwest quarter of southeast quarter of section 26, T. 40 N., R. 79 W. Elevation at top of casing 5050 feet. 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 southeast quarter of section 26, T. 40 N., R. 79 W. 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 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, T. 40 N., R. 79 W. 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, T. 40 N., R. 79 W. 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, T. 40 N., R. 79 W. Depth to Wall Creek sandstone 924 feet. Total depth 974 feet. Initial production 75 barrels. Drilled 1912.

Well No. M-42. Midwest Oil Company. Southeast quarter of northeast quarter of section 34, T. 40 N., R. 79 W. Depth to Wall Creek sandstone 1046 feet. Total depth 1124 feet. Initial production 50 barrels. Drilled 1912.

Well No. M-43. Midwest Oil Company. Northeast quarter of southwest quarter of section 35, T. 40 N., R. 79 W. Depth to Wall Creek sandstone 1030 feet. Total depth 1030 feet. Initial production 300 barrels. Drilled 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, T. 39 N., R. 79 W. 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.

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 amount of water. The well was shot with 320 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, T. 40 N., R. 79 W.

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 a 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. N-5. Northwestern Oil Company. Northwest quarter of southwest quarter of section 2, T. 39 N., R. 79 W. Drilling.

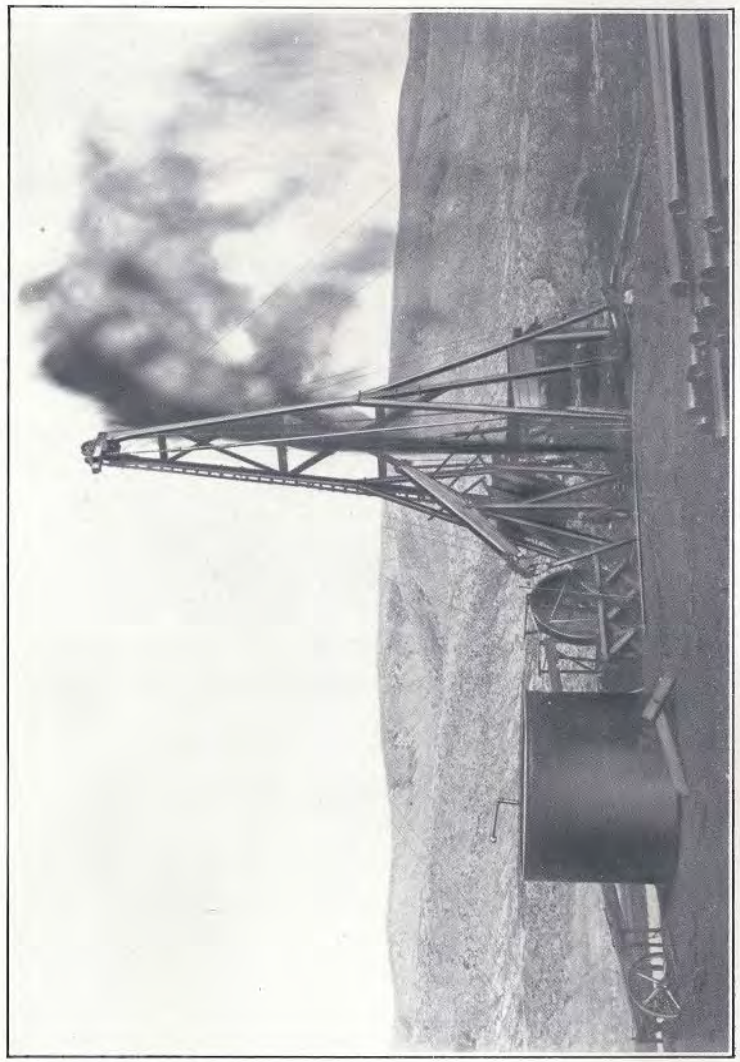
Well No. N-6. Northwestern Oil Company. Northwest quarter of southwest quarter of section 28, T. 40 N., R. 79 W. Drilling.

Well No. W-1. Wyoming Crude Oil Company. Northeast quarter of northeast quarter of section 28, T. 40 N., R. 79 W. 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 from that sand. Oil in small quantity was obtained in the shale at 1140 feet.

THE OILS.

SHANNON DISTRICT.

In the Shannon district, north of the Salt Creek dome, forty wells have been drilled, three of which are dry, four are productive of water only, and thirty-three produce oil. The productive wells in this district obtain their oil from the Shannon sandstone. The production of the wells, all of which are owned by the Wyoming Oil Fields Company, ranges from two to twenty barrels per day. All of the



Midwest Oil Company's Well on Section 13, T. 40 N., R. 79 W.

wells are pumped. The oil is green in color, of paraffin base, and is suitable for lubricating purposes. Several analyses of the Shannon oil are given below:

DR. F. SALATHE, Analyst.

Color	Green
Gravity at 60° F., Specific	.9091
Gravity at 60° F., Beaume	24.0°
Flash	245° F.
Fire	305° F.
Viscosity at 70° F.	240
Not chilled at —3° F.	

(From U. S. Geol. Survey Bull. No. 452, p. 80.)

		SHANNON	SHANNON
Gravity at 60° F.	Specific	.9097	.9085
	Beaume	23.9	24.1
Color by reflected light		Olive Green	Green
Distillation by Engler's Method.	By volume		
Begins to boil °C.		204	213
150° to 300° C. —Water-white oil	cc.	12.5	10.0
	Specific gravity	.7673	.8673
Residuum	cc.	86.9	86.6
	Specific gravity	.9192	.9211
Paraffin—Per cent.		1.14	

The output of the Shannon district is refined at Casper by the Natrona Pipe Line and Refinery Company. A list of the products obtained on refining is given in the following table:

	GRAVITY at 60° F.	VISCOSITY 70° F.	VISCOSITY 120° F.	FLASH	FIRE	COLD	REMARKS
Crude Oil	26.0 B.	.....	.....	275	340	—17	No trace of asphalt.
Auto-Visco—No. 1 Heavy	20.5	.....	.....	600	670	.....	.....
Auto-Visco No. 2	.....	.....	.....	.....	.....	.....	For use with piston feeders.
XXX Cylinder Oil No. 1	22.0	.....	16.35	562	615	.....	For Corliss and similar engines.
XXX Cylinder Oil No. 2	22.5	.....	.....	500	558	.....	For ordinary engines.
Sunset Engine Oil	23.0	48.0	.....	376	447	25	For journals and shafts.
U. S. Cylinder Oil	20.5	.....	12.8	537	600	.....	Dark cylinder oil.
Topaz Engine Oil	27.0	.....	.....	385	440	.....	A heavy-body engine and dynamo oil.
Dynamo Oil	24.0	29.5	.....	351	412	20	.....
Car Oil	22.5	.....	.....	368	420	.....	.....
Railroad Oil	23.5	35.8	.....	328	392	12	.....
Valve Oil	21.0	51.0	.....	456	518	.....	.....
Farmers' Machine Oil	23.0	.....	.....	350	410	.....	.....
Amber Machine Oil	24.0	32.0	.....	362	425	20	.....
Zero Dark Engine Oil	23.6	.....	.....	335	400	— 2	.....
Air Drill Oil	24.0	23.0	.....	320	383	— 4	.....
Air Compressor Oil	22.0	.....	.....	475	560	.....	For use as a substitute for gasoline in motors.
Light Distillate	30.0	.....	.....	230	285	.....	.....
Spindle Oil	28.0	.....	.....	280	335	.....	For use in cotton mills, etc. The oil is stainless.
Neutral Oil	26.5	.....	.....	315	375	.....	.....

Aside from those above mentioned, sewing machine, typewriter, gun, clock, watch, whetstone, harness, floor, buggy and carriage oils, furniture polish, axle grease, and "Antiscalol" (a boiler compound) are produced.

SALT CREEK DOME.

In the Salt Creek dome 81 wells have been drilled, the production per well varying from a few barrels to as much as 2000 barrels per day. All of the wells which obtain their oil from the Wall Creek sand, and some of these which have not reached the sand, are "gushers", the wells flowing intermittently. When these wells are brought in the oil usually rises in a column 100 feet or more into the air. After several minutes the flow subsides, to take place again at periods ranging from twenty minutes to several hours. As stated by Wegemann*, the periodic flow of such wells is probably due to the pressure of the accumulated gas. In the southern and southwestern parts of the field three wells, drilled into the sand, produce water, while two produce small amounts of oil with water. A number of wells have obtained oil in the shale before reaching the sand. Notable among these is the "gusher" well recently drilled west of the dome in the Bothwell syncline.

Analyses of the oil are given below.

DEEP WELL IN SECTION 25. DR. F. SALATHE, Analyst.

Color:—Dark brown with dark olive green fluorescence. Sample clear and free from suspended matter.

Odor		Of gasoline
Specific gravity at 15.6° C.	.82668	(39.3° B.)
Index of refraction at 25° C.		1.4690
Sulphur		Trace

* U. S. Geol. Survey Bulletin 452, p. 73.

RESULT OF DISTILLATION.

	PER CENT.	GRAVITY		INDEX REFRACTION AT 25° C.	REMARKS
		SPECIFIC	BEAUME		
Up to 150° C	18.0	.7290	62.0	1.4070	Begins to boil at 67°
150° to 300°	32.0	.8113	42.5	1.4484	
300° to 350°	13.0	.8503	34.6	1.4713	
350° to 380°	11.0	.8729	30.3	1.4607	Melts at 22°C.
380° to 400°	21.0	.....	.....	1.4893	Semi-solid at ordinary temps.
Residue	5.0				

Essentially a paraffin oil.

ANALYSIS OF SHALE OIL.

F. E. Knoch, Analyst.

Color ..... Dark brown. Dark green fluorescence
Specific gravity ..... .83445 (37.7 B.)
Sulphur ..... Trace

	PER CENT.	GRAVITY		INDEX OF REFRACTION	REMARKS
		SPECIFIC	BEAUME		
Up to 150° C.	16.0	.7325	61.1	1.4054	Begins to boil at 70°
150° to 300°	33.0	.8110	42.6	1.4479	
300° to 350°	12.0	.8561	33.5	1.4717	Melts at 2° C.
350° to 380°	25.0	.8748	30.0	1.4836	
Residue	14 0	semi-solid	Largely distilled over below 400°.		

Paraffin base.

Well in Section 25—1232 feet deep ..... 39.1° Beaume
Well in Section 22— 980 feet deep ..... 38.2° Beaume
Well in Section 23— 135 feet deep ..... 38.1° Beaume

All three samples were the same in general appearance. A dark green color in the reflected light and a dark brown and very cloudy by transmitted light. This latter seems to indicate that the samples were not well settled. All samples show some gas, but No. 1 more than the others, which is also indicated by its gravity. A freezing test of the crude shows considerable amorphous paraffin. It was completely solidified at 15° F. If kept in motion

it should pass through a pipe at 20° F., but certainly not at a lower temperature. A distillation test gave the following results:

Sample No. 1. Boils at 95° F.
20 per cent. naptha ..... 56.5 Beaume
33 per cent. kerosene ..... 45.0 Beaume
5 per cent. mineral seal.
40 per cent. tar.
2 per cent. loss.

The heavy distillates indicate about two and one-half per cent. paraffin wax and a good base for engine oil. The oil contains too much asphalt and sediment for cylinder oil.

(From U. S. Geol. Survey Bull. No. 452, p. 80.)

		IBA (Sec. 22)	STOCK (Sec. 25)
Gravity at 60° F.	Specific	.8314	.8563
	Beaume	38.4	33.5
Distillation by Engler's Method.	By volume		
Begins to boil		84° C.	126° C.
To 150°	cc.	11	1
	Specific gravity	.7215	.....
150° to 300°	cc.	34	36
	Specific gravity	.7875	.7854
Residuum	cc.	54	62.4
	Specific gravity	.8923	.9032
Paraffin, per cent.		5.56	5.63

The oil is refined at Casper, the products being gasoline, benzine, kerosene, distillate, and fuel oil.

No wells as yet drilled in the Salt Creek district have reached the Dakota sandstone. The following in regard to the oils obtained from the Dakota sandstone in the Powder River region is taken from U. S. Geol. Survey Bulletin No. 471 A-3, page 70:

"These oils resemble the heavy oils from Natrona County, but are somewhat different in their character, containing very considerable amounts of asphalt, while the Salt Creek oils show none. The samples here submitted show less than 2.5 per cent. whereas the Lander oils run as high as 15 per cent. In general, these oils are intermediate in their character between the Lander and the Salt Creek

Oils. As to their utilization, they could be used with profit if no better oils were at hand for the production of illuminants, but they are by no means as good for this purpose as the light Salt Creek oils. It is evident that these oils would ordinarily be used for fuel, for which they would require practically no preliminary treatment, although the fuel oil would also be good after the illuminating fraction was distilled off, or after the oils were "skimmed", as this process is called in the trade. There is no doubt that these oils, besides being valuable for fuel, would yield the fine lubricants characteristic of most refining oils. For this, the small amount of asphalt would be only slightly detrimental. Cylinder oils of good grade can be obtained by distilling off carefully the lighter parts of the oil. Ordinary machine oils and other lubricants could be obtained by distilling the oil down to dryness and cutting the distillants according to specific gravity, extracting any paraffin wax which might develop, and then purifying the oil by treatment with sulphuric acid, filtration, etc., in the ordinary way."

ANALYSES OF POWDER RIVER OILS.

	Gravity at 60°F.		Distillation by Engler's Method by volume						Water per cent	Sulphur per cent	Paraffin per cent.	Asphalt per cent.	Unsaturated Hydro-Carbons	
	Specific	Beaume'	Begins to Boil °C	To 150° C. Cubic Centimeters	150-300°C. Cubic Centimeters	150-300°C. Sp. Gr.	Residuum Cubic Centimeters	Residuum Sp. Gr					Crude per cent.	150-300°C per cent.
Open pit	.9180	22.5	190	.....	14.0	.8546	84.3	.9302	0.19	0.38	0.00	2.31	33.2	6.0
Oil seep	.9056	24.6	.....	.....	.....	.....	.....	.....	.....	0.27	.....	.....	.....	.....
Tunnel	.9106	23.75	240	.....	16.5	.8498	80.6	.9226	2.42	0.55	3.12	2.30	27.2	8.0
Open pit	.9150	23.0	210	.....	20.5	.8541	78.7	.9356	0.10	0.38	0.00	2.58	31.6	8.0

Color: Black.

PRODUCTION.

The total production of the Salt Creek district, from its discovery to the present time, is estimated to be 2,500,000 barrels. The production of the field is somewhat curtailed at present as the capacity of the refineries at Casper is not sufficient to handle the entire output of the field. The average daily production is only 7,500 barrels, while the wells already drilled are capable of producing 12,000 barrels.

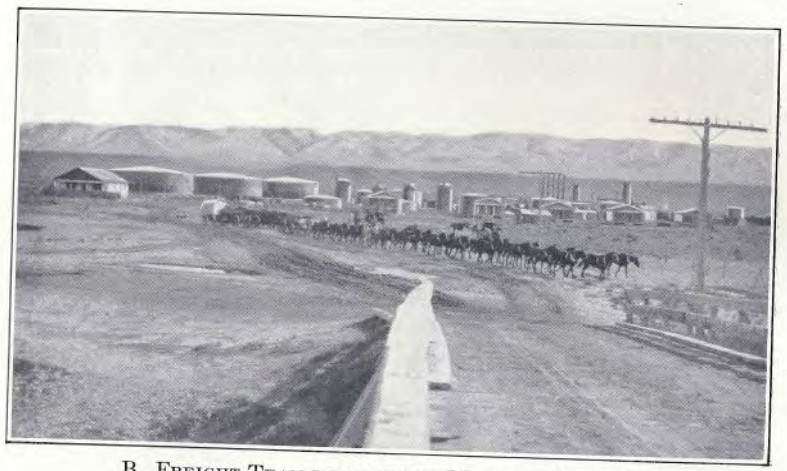
In 1911 section 36, T. 40 N., R. 79 W., was leased to the Midwest Oil Company by the State. Since January, 1912, when the first royalty was paid, the State has received $20,458.20, the royalty being ten per cent. of the gross amount of oil produced at a price of not less than 50 cents per barrel.

The payments were distributed as follows:

	AMOUNT	BARRELS OF OIL
January and February	$ 1,129.25	22,585
March	1,507.50	30,151
April	1,463.50	29,270
May	2,881.45	57,629
June	2,749.75	54,995
July	2,661.10	53,222
August	2,595.55	51,911
September	1,731.85	34,637
October	1,998.35	39,967
November	1,739.90	34,798
TOTAL	$20,458.20	194,165

Although 12 wells have been drilled on section 36 only five are producing, seven being capped. The average daily production of each of the five wells from January to November was 250 barrels.

A. FREIGHT TEAM USED IN HAULING SUPPLIES FROM CASPER TO THE FIELD.



B. FREIGHT TEAM LEAVING THE MIDWEST REFINERY.

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 Casper where it is refined. 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 Chicago & Northwestern Railway and the electric light and power plants in Casper and the nearby towns for use as fuel.

REFINERIES.

Two refineries have been built and are operating at Casper. The Midwest refinery is equipped with seven stills, the still capacity being 4900 barrels of crude oil. Oil from the Salt Creek dome is used entirely in the Midwest refinery, the products being gasoline, 61½ to 63° B., 15 to 18 per cent.; kerosene, 43° B., 15 to 22 per cent.; various grades of distillates; and fuel oil. The refinery is now being enlarged. The Natrona Pipe Line and Refinery Company's plant is equipped with two stills, combined capacity 190 barrels, used for Shannon oil, and six stills, combined capacity 2000 barrels, used for Salt Creek oil, the total capacity of the refinery being 2190 barrels. The products obtained on refining the Salt Creek oil are gasoline, 63° B., 20 per cent.; benzine, 58° B., 2 per cent.; kerosene, 46° B., 25 per cent.; distillate, 38 to 40° B., 5 per cent. The residue is used as fuel. The products ob-

tained on refining the Shannon oil have been given on page 62. The refinery capacity will be doubled during the year 1913.

STORAGE.

Storage facilities consist of steel tanks and earthen reservoirs. The storage capacity of the district, not including earthen reservoirs, is as follows:

Wyoming Oil Fields Company:	
Field	55,200 barrels
Refinery	192,500 barrels
TOTAL	247,700 barrels
Midwest Oil Company:	
Field	175,000 barrels
Refinery	450,000 barrels
TOTAL	625,000 barrels
GRAND TOTAL	872,700 barrels

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, tolls and cordage	4,225.00
Freight to the field	350.00
Erecting derrick	250.00
TOTAL	$6,550.00
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 Well 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
	$2074.50
Portable rig, complete	5385.00
Freight to the field, machinery and casing	650.00
TOTAL	$8109.50

Below is a list of the companies operating in the field with the number of wells drilled by each:

Company	Productive	Abandoned	Drilling	Total
Eclipse Oil Co.	2	2	5	9
Hanley & Bradley	1			1
Hjorth Oil Co.	1			1
Lucky Strike Oil Co.			1	1
Midwest Oil Co.	45	1		46
Northwestern Oil Co.	2	2	2	6
Wyoming Crude Oil Co.			1	1
Wyoming Oil Fields Co.	51	7		58
Total				123

FUTURE DEVELOPMENT.

SALT CREEK DOME.

In the Salt Creek dome the productive area has been roughly outlined by the wells already drilled. It is possible to predict with some degree of certainty whether a well drilled at any point in the dome will produce oil or water. However, absolute determination of the occurrence of oil at any one locality is not possible. Small structural folds, not indicated on the surface, may occur, or, locally, the sand may be so hard and firmly cemented as to be incapable of acting as a reservoir for oil. It is probable that drilling into the Wall Creek sand east of the range line between ranges 78 and 79, north of the southern boundary of sections 11 and 12, T. 40 N., R. 79 W., west of the Shannon escarpment on the western side of the dome, and south of an east-

west line drawn through the center of sections 11 and 12, T. 39 N., R. 79 W., will not be attended by success.

It is impossible to say whether the Dakota sandstone will be productive of oil in the Salt Creek dome. The structure is favorable to the accumulation of oil in that sandstone, which may be reached at depths ranging from 2400 to 3600 feet. The character of the oil obtained from the Dakota sandstone in the Powder River district has been given on page 65.

TEAPOT DOME.

No indications of oil were noted in a hurried inspection of the Teapot dome. The structure is favorable and the Wall Creek sandstone may be reached at depths somewhat greater than in the Salt Creek dome. However, no wells can be drilled in the Teapot dome until the conservation policy in force at present is modified.

BOTHWELL SYNCLINE.

The Hjorth well, which recently obtained a large flow of oil in the shales of the Bothwell syncline, has led to the general belief that that region will be highly productive. All conditions are unfavorable to the accumulation of oil in the Wall Creek sand, which lies from 2000 to 2800 feet below the surface. In the trough of the syncline, near the location of the Hjorth well, the Wall Creek sand lies about the 2500-foot contour, while in the southern part of the dome water was obtained in that sand at the 3500-foot contour.

DUGOUT CREEK FIELD.

The area known as the Dugout Creek field holds forth promise of becoming productive of hydrocarbons, the arguments in favor of the accumulation of petroleum in the Salt Creek dome being applicable, with some modification, to that district. The only direct evidence that the Wall Creek sand may be productive in the Dugout Creek district is the showing of oil and gas obtained in the well drilled in section 16, township 40 north, range 80 west (see well No. A-1, page 37). The structural conditions are favorable, as the field occupies the eastern limb of the Powder River anticline, and the Wall Creek sand may be cut at the same elevation above sea level as in the Salt Creek dome.

If the anticlinal theory of the accumulation of oil may be applied to this region, any water in the Wall Creek sand will occupy the trough and sides of the Bothwell syncline, while the oil will be found above the water on the flanks and crests of the adjacent anticlines. The water would rise to approximately the same height on either side of the Bothwell syncline, assuming that the Wall Creek sand is homogeneous in texture. As water has been obtained in the Wall Creek sand in section 2, T. 39 N., R. 79 W., at the 3500-foot contour, it may be assumed that water will be obtained at the same contour in the Dugout Creek field, while oil may be obtained above that contour. The 3500-foot contour is roughly parallel to and about one mile west of the outcrop of Shannon sandstone which extends along the range line between ranges 79 and 80. West of this contour, in sections 14, 15, 22, 23, etc., oil may be obtained at depths ranging from 800 to 2000 feet, while

east of the 3500-foot contour water may be expected. On the whole the Dugout Creek field holds forth greater promise of reward than any of the other nearby districts.

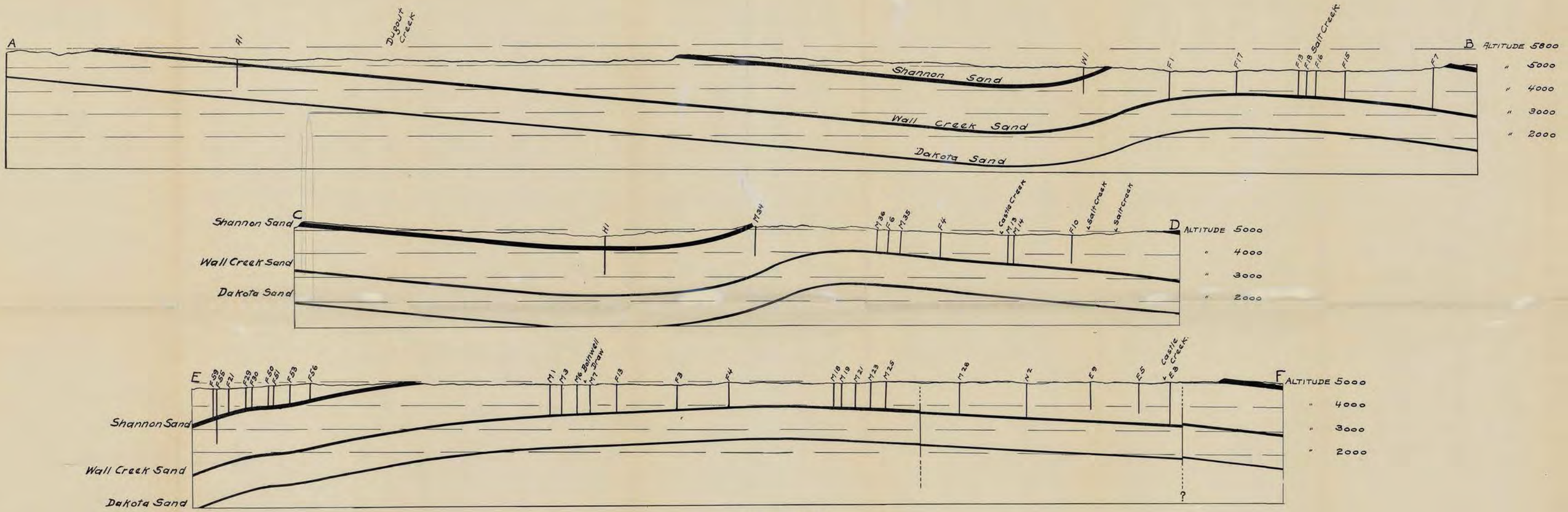


PLATE XVIII

SECTION ACROSS SALT CREEK OIL FIELD ALONG LINES SHOWN ON PLATE XVII

BY C. E. JAMISON, STATE GEOLOGIST

SCALE 1 INCH TO 2000 FEET

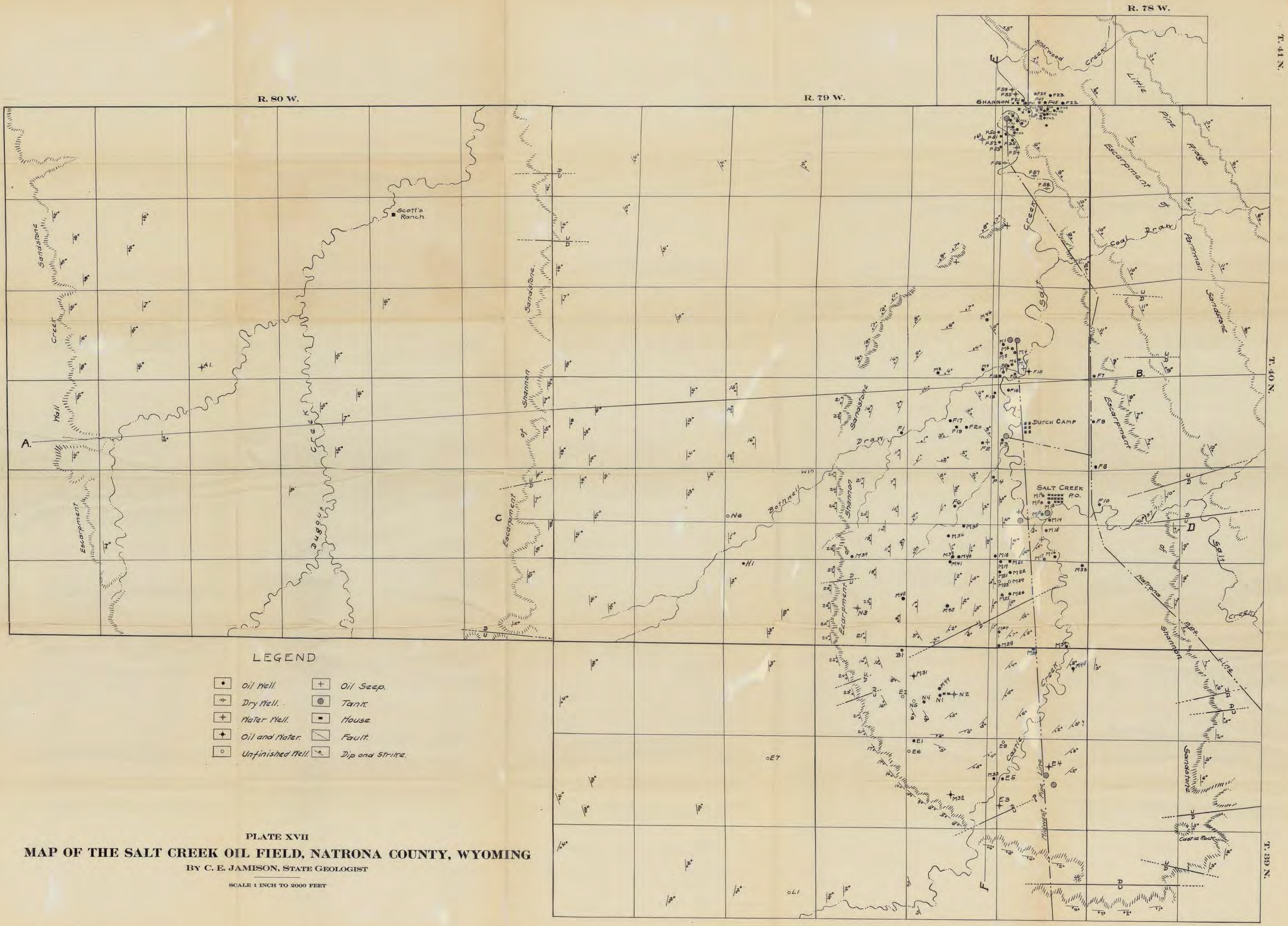

R. 80 W.
R. 79 W.
R. 78 W.
T. 41 N.
T. 40 N.
T. 39 N.
Scott's Ranch
Dutch Camp
Salt Creek P.O.
Shannon
Castle Rock
Sandstone
Wall Creek Escarpment
Dugout Creek
Escarpment of Shannon Sandstone
Bothwell Draw
Shannon Escarpment
Salt Creek
Sherwood Creek
Little Pine Ridge
Escarpment of Parkman Sandstone
Coal Draw
Escarpment of Shannon
Natrona Pipe Line
Midwest Pipe Line
Castle Creek
LEGEND
Oil Well.
Dry Well.
Water Well.
Oil and Water.
Unfinished Well.
Oil Seep.
Tank.
House.
Fault.
Dip and Strike.

PLATE XVII

MAP OF THE SALT CREEK OIL FIELD, NATRONA COUNTY, WYOMING

BY C. E. JAMISON, STATE GEOLOGIST

SCALE 1 INCH TO 2000 FEET