Ralph S. Mason

STATE OF OREGON

DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

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Progress Report on Coos Bay Coal Field

By

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New Appendix

FOREWORD

This report, covering a rather brief study of conditions and mining developments in the Coos Bay coal field, is a re-run or second edition. It was first issued during the spring of 1938. The material is the same as the first edition with the exception that an appendix has been added covering stoker tests on Coos Bay coal by the U. S. Bureau of Mines.

Since this Bulletin was first prepared by Mr. Libbey two one-ton representative samples of Coos Bay coal were sent to the Non-metallics Laboratory of the U. S. Bureau of Mines at Seattle, and burning tests were made in domestic type stokers to see how the coal rated in comparison with coals being shipped in to Oregon from the mountain states. The result was that the Coos Bay coals compare quite favorably, as may be noted in the appendix beginning at page 14.

Samples of Coos Bay coal were sent to an eastern testing station to determine if satisfactory coke could be made from them. The result was negative. It appears that the coal is not a coking type, at least not the coals that are at present being mined around Coquille. Whether or not this applies to the Eden Ridge and some of the other coals is not yet known.

As this is written, a technician of the U. S. Bureau of Mines, assisted by an engineer of this Department, is starting on a project of sampling in the better known coal areas of Oregon. The samples taken will be tested by the U. S. Bureau of Mines in order to determine the characteristics of the different coals and the best utilization of the various grades. Several months will be required for this work. When the results are known, they will be published by the Department.

For the present, it appears that coal dealers within a radius of, say, 100-150 miles of Coos Bay are justified in encouraging use of Coos Bay coal on the basis of its adaptability for use in automatic stokers, particularly small types for house heating.

Earl K. Nixon, Director

Portland, Oregon,
May, 1939.

THE COOS BAY COAL FIELD

Introduction

This large coal field lies on and near the Oregon coast, in Coos County, its northern boundaries surrounding Coos Bay, which is about 200 miles south of the mouth of the Columbia River. The Coquille River which meanders through the southern part of the field drains to the Pacific Ocean at Bandon, located about 18 miles south of the mouth of Coos Bay. The important cities of the area are Marshfield, North Bend, and Coquille. The first two adjoin on the west side of Coos Bay and are important lumber centers, both in manufacturing and coast-wise shipping; Coquille, on the Coquille river, in the southeastern part of the district, is the county seat and is also a lumber and dairying center.

The field is roughly elliptical in outline and is about 30 miles long north and south by about 12 miles wide east and west, giving an area of approximately 230 square miles.

In 1898 the area was studied by J. S. Diller of the U. S. Geological Survey and results were published in the Nineteenth Annual Report of the Director (Part 3) and in the Coos Bay folio (no. 13) of the Geologic Atlas of the United States. Later work by Diller and Max A. Pishel was published in the U. S. Geological Survey Bulletin no. 431. Much of the information relating to geology and structure in this report has been obtained from these publications.

The townships included in the field, as shown by the accompanying map by J. S. Diller and Max A. Pishel, are 24 to 29 S., R. 12, 13 and 14 W.

U. S. Highway 101 crosses the field from North Bend and Marshfield to Coquille and Bandon, thence continues south along the coast. A branch of the Southern Pacific system serves the district from the coast on the north end to Coquille and Myrtle Point on the south.

Generally the locality is one of low hills, rising in places to broad summits with altitudes ranging up to 700 or 800 feet above sea level. There are many streams and creeks draining to tidewater sloughs which are a peculiar geographical feature of the district. Most of the commercial timber was cut off many years ago and a large part of the surface is now covered by a dense vegetation of second-growth trees and thick underbrush.

The climate is generally mild, with no extremes of temperature. There is a high annual precipitation occurring mostly in winter months.

The sandstones and shales which make up the great mass of the rocks of the region are grouped in the Arago formation of Eocene age, and have a probable thickness of at least 10,000 feet. According to Diller, the coal occurs in four zones distributed through about 8,000 feet of strata, in the upper half of which occurs the so-called Newport coal. Most important economically is this upper zone.

Structurally, the coal field is an eroded anticline. Subordinate folds divide the area into basins, with the principal fold, the Westport Arch, the axis of which trends N. 35° E., separating the two largest basins, - the South Slough on the west and the Beaver Slough basin on the east. Minor folding and faulting has formed smaller basins in the northern part of the field.

The Beaver Slough basin is the most extensive in area and most important economically. It occupies most of the eastern and southern parts of the coal field. The Newport basin, southwest of Marshfield, has been practically exhausted. The North Bend, Flanagan and Empire basins, north and west of Marshfield, are small. In the South Slough basin the formation is much disturbed and prospecting is difficult because of the heavy vegetation.

Object of the Investigation

The State Department of Geology and Mineral Industries determined to make a short preliminary study of present activities in the area in order to gather information on present production and to obtain some representative samples of the coal being mined. The United States Bureau of Mines has been making extensive experiments in testing the use of low grade coals in a stoker adapted to household heating and has obtained encouraging results. An arrangement was made with the Bureau so that Oregon coals could be tested along the same lines.

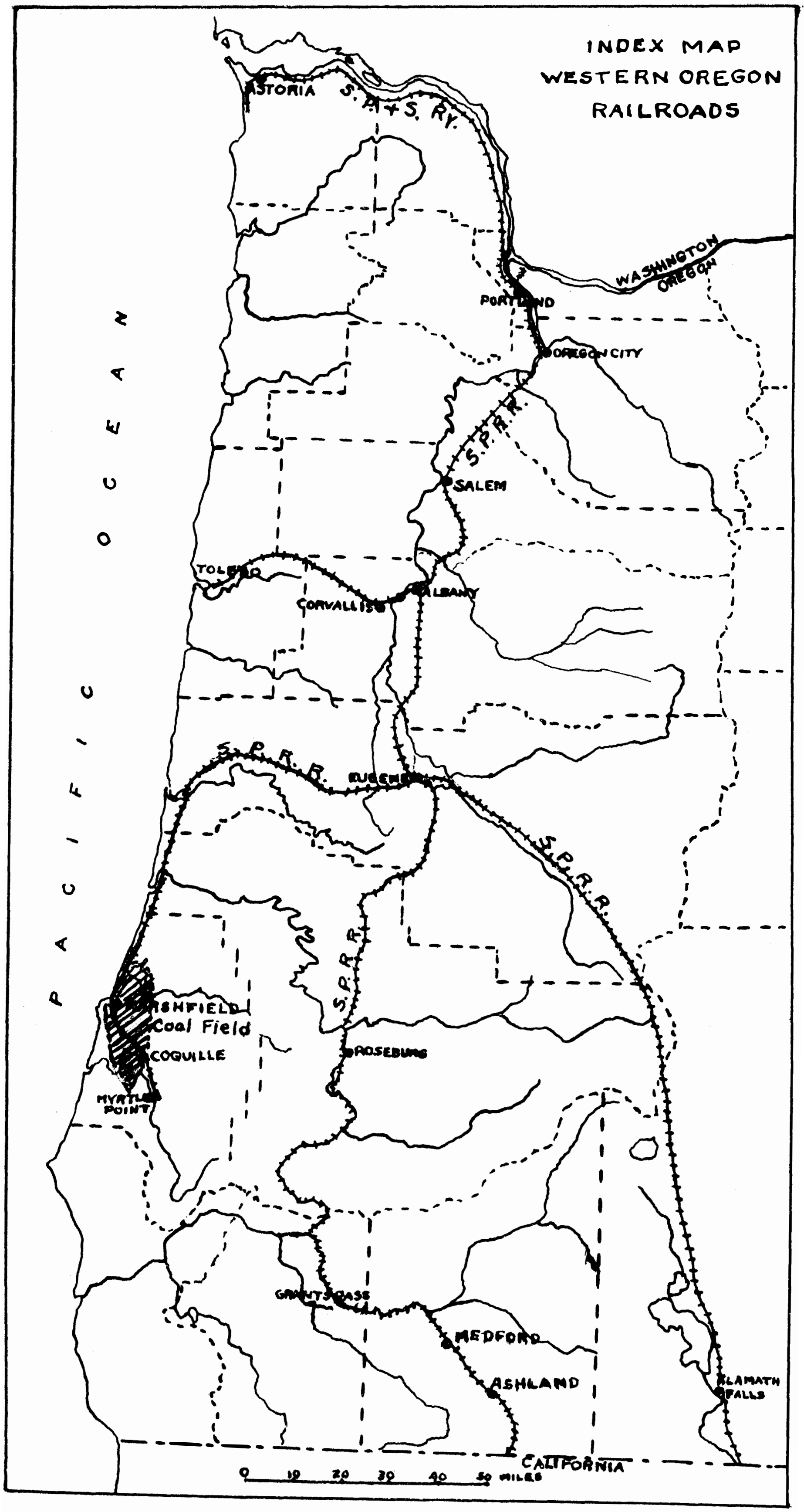
The operating mines in the Coos Bay coal field are listed as follows: Southport Coal Co., Overland Coal Co., the Thomas Mine, and the Alpine Coal Co. Short descriptions of these operations are given on the following pages.

Southport Coal Company

This company, controlled by James H. Flanagan, is mining in the NE¼ of sec. 22, T.26 S., R.13 W., and is reached by traveling five miles south from Marshfield city limits on U. S. Highway 101 and then 0.5 mile west over a plank road. The property, consisting of about 600 acres in sec. 8, 14, 15, 22 and 23 of the above township, is leased from the Southport Land and Commercial Co., which owns approximately 2700 acres in the township.

Southport Mine:

The mine was opened first in 1875 on a bed believed by Diller to be at a higher horizon than the Newport bed, and operations were not very successful. Later, the Newport bed was opened and the then-named New Southport


INDEX MAP
WESTERN OREGON
RAILROADS
PACIFIC OCEAN
ASTORIA
S. P. & S. RY.
WASHINGTON
OREGON
PORTLAND
OREGON CITY
S.P.R.R.
SALEM
TOLEDO
CORVALLIS
ALBANY
S.P.R.R.
EUGENE
S.P.R.R.
S.P.R.R.
MARSHFIELD
Coal Field
COQUILLE
MYRTLE POINT
ROSEBURG
GRANTS PASS
MEDFORD
ASHLAND
KLAMATH FALLS
CALIFORNIA
0 10 20 30 40 50 MILES

mine for several years maintained a fairly large production, much of which was shipped to San Francisco by water. In recent years it has been reopened by Mr. Flanagan, and a small output has been sold for local domestic heating.

The present opening to the mine is through an old slope inclined above horizontal at about 7 or 8 percent and running a little east of north along the bed. Coal is being mined in a room about 3,000 feet from the portal from two benches of coal separated by a clay parting 8-10 inches thick. A section of the bed being mined is as follows; hard sandstone footwall, 28 inches of coal, 9 inches of clay, 24 inches of coal, hard sandstone hanging wall. Sample no. 4 represents the bottom bench and no. 5 the upper bench.

Rooms are opened about 35 feet wide with pillars between about 20 feet wide, with a wider stump on the gangway. Stulls are used in the rooms, but the roof is strong and relatively few are necessary in the section seen. No explosives are used in mining the coal. Cars are hauled to the face of the rooms from a gathering place at the main entry by one mule. Trains of two one-ton cars each are taken out through the main entry by two mules, the driver using brakes for most of the out-going trip. One driver handles the gathering as well as the trips to the bunker so that only seven or eight such trips can be made in eight hours. Production is at the rate of about 10 to 15 tons a day depending on weather conditions which govern the demand. Five men are employed, including a truck driver.

The coal is washed with a hose on screens at the bunker, and three sizes are made, namely, lump, nut and pea. Most of this coal is hauled to Marshfield and retailed through the Reynolds Development Co.

Reserves of coal in this leased property are probably large - in hundreds of thousands of tons. By driving an entry 250 feet long from U. S. Highway 101 on Isthmus Slough, Mr. Flanagan estimates he could make available over 200,000 tons of coal from above the entry level, in addition to the reserve available in the area being mined at present, estimated by Mr. Flanagan at 600,000 tons.

An analysis of a sample of this coal is given on the following page.

C O P Y

Department of Commerce-Bureau of Mines

Coal Analysis Report

Lab.No.A90058
Can.No.D896
136

Operator: Jas. H. Flanagan Mine, Southport

Sample of sub-bituminous coal.

State, Oregon County, Coos Bed, Southport

Town, Marshfield.

Location in Mine Upper Works - in counter or Morrisoul room .
2300' from portal (old entry)

Method of sampling - standard.

Date of sampling 5/27/33 Date of analysis 6/5/33

B. of M. section Collector S. H. Ash

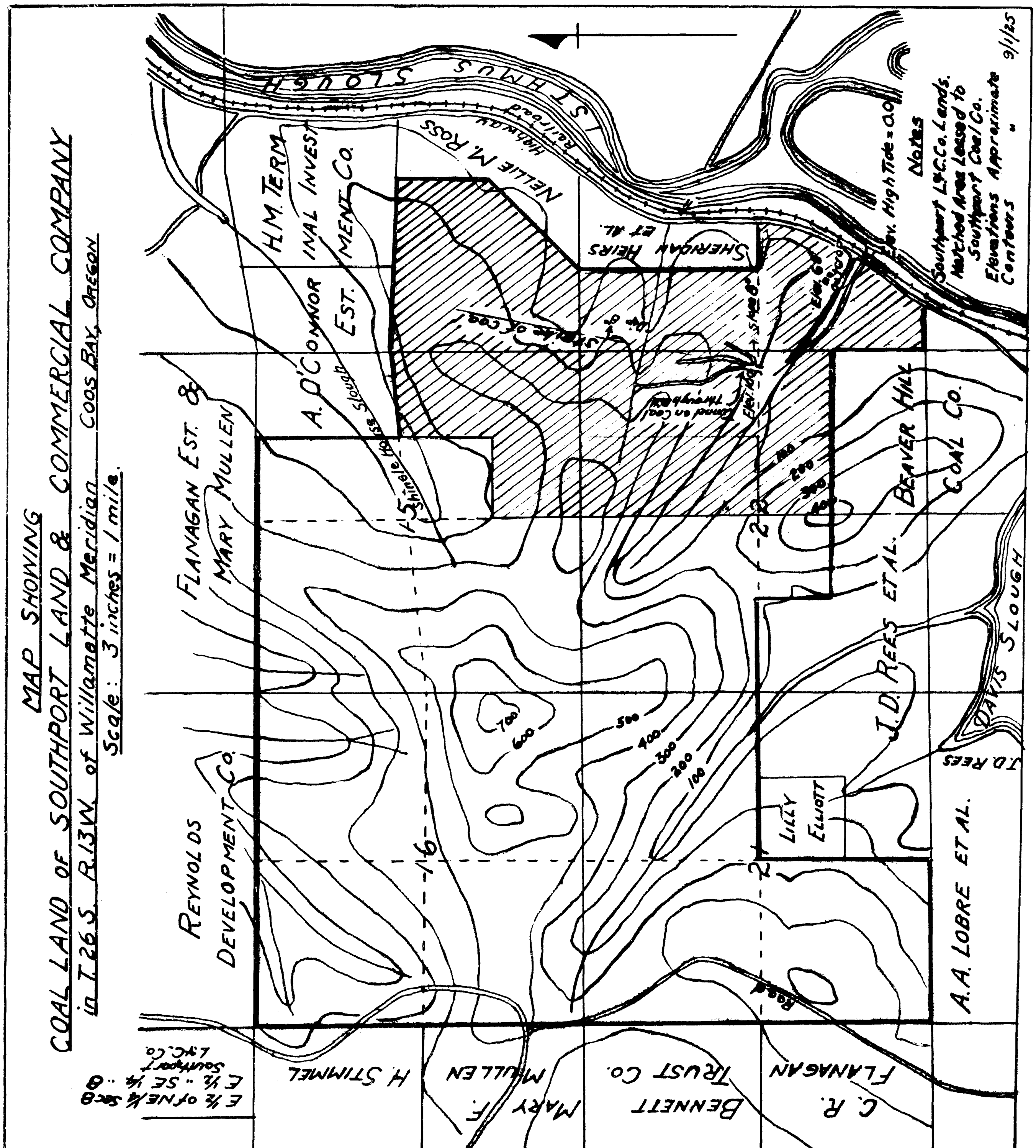
Air-dry loss 3.3

		Coal (air-dried)	Coal (as received)	Coal (Moisture free)	Coal (Moisture and ash free)
Moisture		14.4	17.2		
Vol. matter		34.8	33.6	40.6	45.2
Fixed Carbon		42.1	40.8	49.2	54.8
Ash		8.7	8.4	10.2	
		100.0	100.0	100.0	100.0
Hydrogen		6.0	6.2	5.1	5.7
Carbon		58.0	56.1	67.8	75.4
Nitrogen		1.3	1.2	1.5	1.6
Oxygen		25.3	27.5	14.6	16.5
Sulphur		0.7	0.6	0.8	0.8
Ash		8.7	8.4	10.2	
		100.0	100.0	100.0	100.0
Calorific	cal.	5678.	5489.	6633.	7383.
value	Btu	10220.	9880.	11940.	13290.

Softening temperature of ash 2080 F.

Date 6/9/33

(signed) H. M. Cooper, chemist.


MAP SHOWING
COAL LAND OF SOUTHPORT LAND & COMMERCIAL COMPANY
in T.26 S. R.13 W. of Willamette Meridian
COOS BAY, OREGON
Scale: 3 inches = 1 mile
ISTHMUS SLOUGH
Railroad
Highway
NELLIE M. ROSS
H.M. TERMINAL INVESTMENT CO.
A. O'CONNOR EST.
SHERIDAN HEIRS ET AL.
FLANAGAN EST. & MARY MULLEN
Shingle House Slough
REYNOLDS DEVELOPMENT CO.
BEAVER HILL COAL CO.
J.D. REES ET AL.
J.D. REES
DAVIS SLOUGH
LILLY ELLIOTT
A.A. LOBRE ET AL.
C.R. FLANAGAN
BENNETT TRUST CO.
MARY F. MULLEN
H. STIMMEL
Road
700
600
500
400
300
200
100
Notes
Elev. High Tide = 0.0
Southport L & C Co. Lands.
Hatched Area Leased to Southport Coal Co.
Elevations Approximate
Contours "
9/1/25
E ½ of NE ¼ Sec. 8
E ½ " SE ¼ " 8
Southport L & C Co.

Overland Coal Company

Location:

This property, consisting of 160 acres in the NE$\frac{1}{4}$ sec. 9 T. 27 S. R. 13 W., is reached via U. S. Highway 101 south from Marshfield 10 miles to a small concrete overpass over the railroad. At this point a dirt and plank road turns off to the northwest, and the distance from this point to the mine is 1.8 miles. The property is owned and operated by George Chard, Evor Ruberg, Adolph Ruberg, and John Anderson.

Overland Mine:

At present the output is about 10 tons a day, of which all is sold locally for domestic heating. The coal is mined through an adit driven northerly on one of the beds of the Beaver Hill group. Rooms are mined up the dip of approximately 30 degrees. No explosives are used in the mining. The writer did not go underground at this property, but the bed is reported to be 6 feet thick, separated into two benches by 14 to 16 inches of sandy clay. Two cars each holding 1700 pounds are brought out at a trip by one mule over a 36 inch gauge track of 30-pound rails. The portal of the adit and the bottom of the bunker are at the same level, so the cars are hoisted by means of a gasoline hoist to the level of the top of the bunker. As it slides over screens into the bunker, the coal is washed by water jets from a pipe and by a hose. Nine men are employed at the property.

A sample, marked no. 6, was taken of mine run coal, before washing, from cars at the bunker.

This company retails its own coal and has two trucks for delivering it. The owners are planning to resume the sinking of an incline, started last year and now down 150 feet. The collar of this new incline is above the bunker and handling of the coal will thus be simplified. They believe that surface water will be shut off from the work through this incline and that they will have very little water to handle.

According to Diller's mapping, approximately half of this quarter-section is underlain by one bed of coal and about 40 acres would have two beds, all lying within 2,000 feet of the surface. This would be the equivalent of 120 acres underlain by coal, and it is probably permissible to use the figure of 4,000 tons of recoverable coal to the acre.

There is a railroad siding called Overland near the junction of the mine road and Highway 101.

Thomas Mine

Location:

Mr. Zeph Thomas has about 300 acres leased in sec. 9, T.37 S., R.13 W., and is now mining in the SE$\frac{1}{4}$ of the section. The mine is reached by going south from Marshfield on Highway 101 for a distance of 10.5 miles to the north end of the town of Coaledo, and then turning west and northwest on a rough dirt road for a distance of one mile to the mine bunker.

Mine:

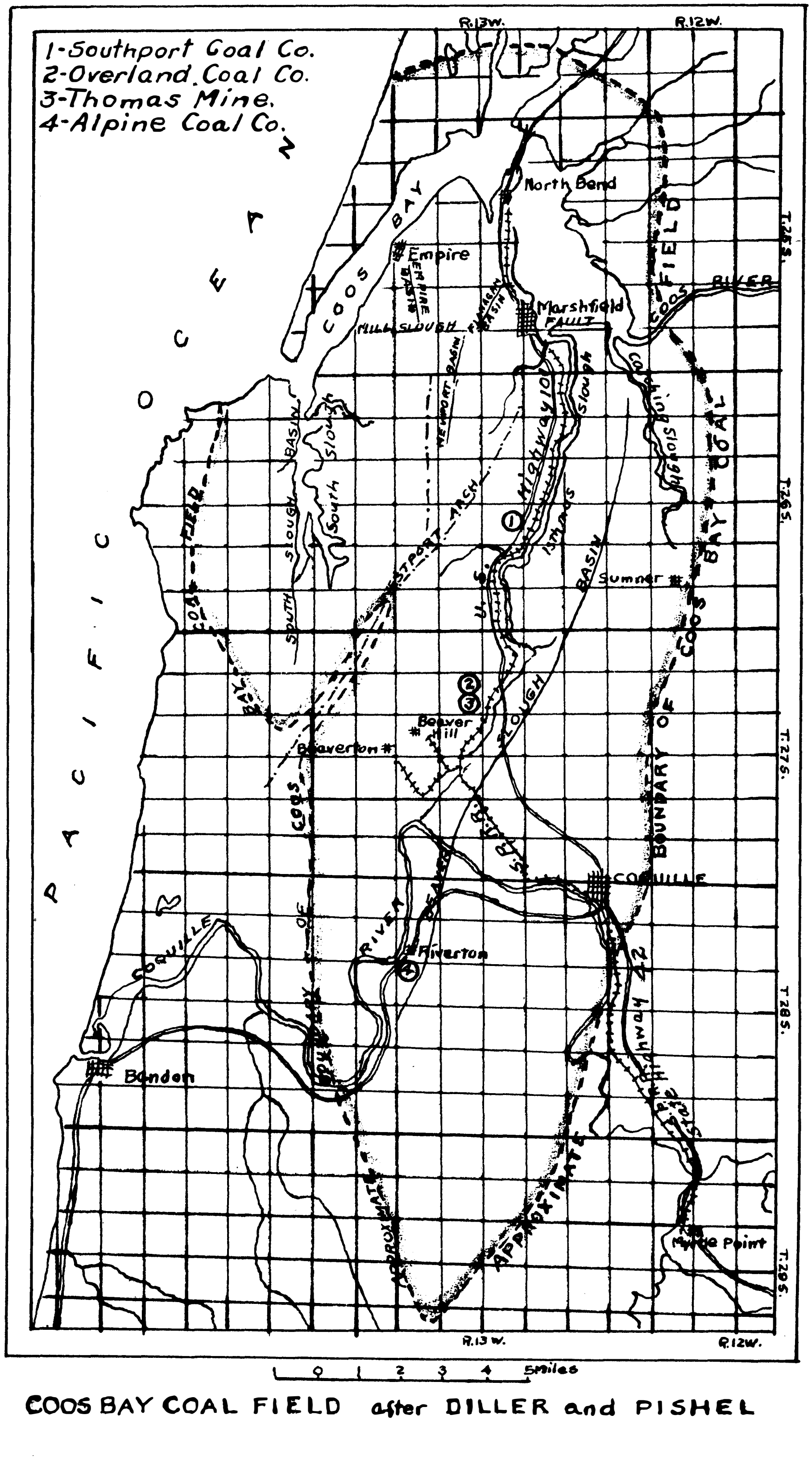
The coal is mined through an adit, driven in a northerly direction on the same Beaver Hill bed that is being mined at the Overland property. The Thomas mine was opened in 1936 and only a small tonnage has been removed. Present output is 5 or 6 tons a day. The room being worked at present is in about 500 feet from the portal, and has been driven up the dip at an angle of about 35 degrees for about 30 feet. The coal is drawn through a chute into a one-ton car and hauled to the tipple at the bunker by one mule over a 36-inch gauge track laid with 30-pound rails.

At this working place the bed has a section as follows:

Sandstone footwall
Bone coal, 8-10 inches
Coal, 20 inches
Sandy clay, 8-10 inches
Coal, 36 inches
Sandy clay, 8 inches
Coal, 12-16 inches, left for roof support
Sandy shale hanging wall

Both benches are mined with a pick by undercutting and removing the clay seams. Stulls are used fairly close together in the room as the roof is not strong. The coal is washed over screens by a hose at the bunker. Three men are employed. Mr. Thomas delivers the coal by truck, chiefly at Marshfield. The property is one mile from the railroad at Coaledo.

According to Diller's mapping, this whole quarter-section is underlain by coal, all above a depth of 2,000 feet.



COOS BAY COAL FIELD after DILLER and PISHEL

Alpine Coal Company

Location:

This property is on Highway 101 at the southwestern edge of the town of Riverton and 6 miles west of Coquille, the nearest railroad point. However, the mine is within a hundred yards of the Coquille river, which, with a little dredging, could be made navigable for deep sea shipping. This company, controlled by W. T. Alpine, is operating under lease from the Riverton Coal and Development Co. The lease covers about 230 acres in sec. 17 and 18, T. 28 S., R. 13 W.

Alpine mine:

Entrance to the mine is through a 15-degree incline about 500 feet deep, sunk on the bed, with a direction a little south of east. Here the strike of the bed is a few degrees east of north. Present mining is at or near the 500 foot level, where a long entry, in places rather low, has been driven about 1,000 feet south. Rooms are driven up the dip. The mine has been operating about 5 years. At present most of the coal is being mined from rooms at the south end of this long entry.

Rooms are carried about 40 feet wide and separated by pillars about 35 feet wide at the widest part. Many stulls are used. Cars are loaded at the face of the rooms, an empty being pulled up by a loaded car going down in an adjoining room. The coal is mined in one bench with picks, an average of about 36 inches of coal, containing a few irregular small seams of bone, being removed. Hard sandstone forms the roof, but on the footwall there is about 10 inches of shaley coal which is picked out to get a footing for stulls on the hard sandstone beneath. One small horse hauls 2 one-ton cars to the bottom of the incline, where the cars are hoisted singly to the surface and trammed to the bunker. Here the coal is washed on sloping screens under water jets.

The little water which the mine makes is handled by a small electric reciprocating pump. Ventilation is obtained by means of an exhaust fan near the collar of the incline.

Present production is about 20 tons a day. This will be increased somewhat during the coldest weather. Capacity with present equipment is about 55 to 60 tons a day. Ten men are employed underground.

Two samples were taken; one (no. 9) near the bottom of the incline where a new entry is being started in a northerly direction, and the other (no.10) at the south heading of the long south entry. Both samples were of the entire thickness of the single 36 inch bench which carries a little bone.

This locality is not shown in Diller's detailed mapping of the coal outcrops. The bed being mined is relatively thin and probably would not yield much more than 3,000 tons of recoverable coal to the acre. There probably is, however, an additional bed of coal underlying a large part of the leased ground. If both seams were estimated, a fairly large tonnage reserve would be indicated above a depth of 2000 feet.

GENERAL

Three of the mines are opened through adits which handle a large amount of surface water. The fourth, mining at a depth of 500 feet slope distance on a 15-degree incline, is below the zone of heavy surface drainage and has to pump only a small quantity.

Underground air circulation appears to be good and in only one property is forced ventilation necessary. Naturally, in operating on such a small scale, without the use of explosives, a large volume of new air is not essential. For the same reasons no coal gas is noticeable and open lights are used.

Although such small operations usually tend to increase unit costs, at these mines the owners share in the manual labor and the overhead expense is at a minimum. Most of the mining is done on contract and probably the total unit operating cost is under $2.00 a ton at the tipple. Washing, trucking, handling, general expense and profit would account for the difference between this cost and the retail price. Lump coal retails at Marshfield for $7.00; at the bunkers it sells for $4.50. Nut coal and pea coal retail in Marshfield for $5.50 and $4.50 respectively; at the bunkers these grades sell for $2.00 a ton less.

Economic Factors

Quality of the Coal:

The Coos Bay coal is classed by the U. S. Geological Survey as high-grade, sub-bituminous. It is non-coking and carries a rather high percentage of ash. It slacks on exposure and would have a tendency to ignite spontaneously if stored in large amounts. The color is black, the luster subvitreous to dull and the facture irregular to subconchoidal. The texture is generally rather soft and brittle, pieces shattering easily. Jointing or cleat commonly separates the coal, as mined into blocks.

Typical analyses of coal mined in the past give values as follows:

	%
Moisture	11 - 20
Volatile Matter	30 - 40
Fixed Carbon	35 - 45
Ash	8 - 12
Sulphur	1.3 - 1.6
Calorific value B.t.u.	9,000 - 10,000

Production:

Production records from 1882 to 1918 give the total output of the field as a little in excess of 2,300,000 tons.* In 1905 the largest annual amount 110,000 tons, was produced. In 1917, the output was 28,327 tons, and, from this, the annual production has gradually fallen to about 9,000 tons,** to supply local heating demands, with a small quantity shipped inland by truck. The loss of market has been caused by the competition of California fuel oils and wood produced largely as a waste product from local mills. Coos Bay coal has had to compete with higher grade coal from Utah and Wyoming, which is mined on a large scale and which can be stored in any desired quantity. This out-of-state coal is merchandized by modern methods, and has retail outlets established throughout the state. Washington coal is also being brought in and marketed, especially in the Portland area. All of these factors have combined to reduce the demand for Coos Bay coal to the present low point.

Reserves:

The field has undoubtedly a large coal reserve. In the U.S.G.S. Coos Bay Folio (no. 13) J. S. Diller gives an estimate, made by M. R. Campbell, of 1,000,000,000 tons of possible coal in the whole field. In the absence of development, exact figures are impossible, but measures which include the so-called Newport coal are quite persistent and the seams show little variations in the quality of coal or thickness of the mineable benches. There is some minor faulting but rarely in sufficient extent to affect the mining materially.

In the Beaver Slough basin, assuming an average thickness of 4½ feet and an average dip of 26 degrees, competent authorities have estimated the Newport coal beds above a depth of 2,000 feet at a little over 7,000 tons per acre. Assuming an average extraction of 60%, the recoverable coal would be 4,000 tons per acre. According to Diller's mapping of outcrops, there would be something in excess of 25,000 acres in the Beaver Slough basin underlain by coal above 2,000 feet in depth.

Transportation:

The area is favorably situated in relation to shipping facilities. A large part of the field is accessible to water transportation through Coos Bay and the tributary sloughs. In the southern part of the field, the

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* In this connection it is interesting to note, that in the Coos Bay Folio Diller states that the Newport basin contained 6,000,000 tons of coal, most of which was available. The coal in this basin has been exhausted, and there is a wide divergence between Diller's estimate and the recorded production. In addition to the mines of the Newport basin, a large production was maintained for several years by the Beaver Hill mine, and smaller outputs by several others, in the Beaver Slough basin. It is probable that the real production of the field has been considerably greater than that stated.

** Production 1938 was 9,271 tons.

Coquille river could readily be made navigable for deep sea shipping. A branch line of the Southern Pacific system traverses the area, and highway transportation is afforded by U. S. Highway 101 and State Highway 42 which runs east from Coquille to connect with U. S. Highway 99 just south of Roseburg.

The following table shows the railroad freight rates on coal from Marshfield to those interior cities which would appear to be in the market area for this coal; also, for comparison, the rates to Portland for some western Washington coals are included. The latter have a freight advantage in the Portland area. The rate to Portland is supposed to be low in comparison with rates to other interior cities because of water competition. However, it would seem as if some revision of rates to these interior cities might be possible if any considerable amount of coal could be shipped from Marshfield.

From	To	Distance miles	Rate per ton	Rate per ton-mile
Marshfield	Portland	245	$2.50	$0.0101
"	Salem	192	3.00	.0156
"	Eugene	121	2.50	.0207
"	Roseburg	196	3.10	.0158
"	Grants Pass	295	3.75	.0127
"	Medford	327	3.85	.0118
"	Klamath Falls	315	5.00	.0159
Seattle	Portland	183	2.00	.0109
Tacoma	Portland	143	1.71	.0120
Centralia	Portland	94	1.22	.0130

The rates from Centralia to Portland and from Marshfield to Eugene should be comparable because of their short hauls. If the existing Centralia to Portland per ton-mile rate were applied to the Marshfield-to-Eugene distance, the rate would be $1.57 instead of the established rate of $2.50.

Comparison of Fuel Values:

While the Coos Bay coal has a high ash content, it has certain advantages for household heating. It ignites quickly and burns with a hot flame, yielding little soot and clinker. It has proved a very economical fuel in certain types of domestic stokers. Experiments to apply its use in such stokers are being conducted by the U. S. Bureau of Mines. Tests on similar coals have been very encouraging.

The following table compares the unit heating value of different fuels used in the Portland area in terms of British Thermal Units (B.t.u.)* which

* The heat required to raise the temperature of one pound of water from 62 to 63 degrees F. 1 B.t.u. equals 0.252 calorie.

can be purchased for 1¢. Assumptions are made as to retail price of Coos Bay coal since none is sold in Portland at the present time. Any comparison of solid, liquid and gaseous fuels is, of course, unfair without indicating the efficiency of combustion, which would depend in part upon the equipment involved. However, the tabulation gives a fair comparison of the solid fuels and indicates that the Coos Bay coal compares favorably with other coals sold in this region.

The cost of heat units developed from electric energy at different unit costs of power are included in the table for reference, since statements have been made concerning the possibility of using the energy developed at Bonneville for domestic heating.

	B.t.u.		Retail price	B.t.u. per 1¢
Coos Bay lump	20,000,000	per ton	$9.00	22,222
" " nut	18,000,000	" "	8.00	22,500
" " slack	16,000,000	" "	7.00	22,857
Utah & Wyoming lump	27,000,000	" "	13.65	19,780
" " nut	26,000,000	" "	12.50	20,800
" " slack	25,000,000	" "	10.50	23,810
Washington coal				
Bituminous slack	23,000,000	" "	9.50	24,210
Lignite	18,000,000	" "	9.25	19,459
California Diesel oil	140,000	per gal.	0.065	21,538
City gas	570 per cu.ft.		0.0004	14,250
Electric Energy (1 Kw.hr. = 3411 B.t.u.)				
	@ 3¢ per Kw.hr.			1,137
	1¢ per Kw.hr.			3,411
	5 mills "			6,822

In regard to the operating costs of residential stokers, the U. S. Bureau of Mines states, *Relative total costs of coal, coke, oil and natural gas, based on tests and survey conducted in Columbus, Ohio, were found to be in the following order:

Oil, 177; natural gas, 151; bituminous coal (stoker fired), 119; bituminous coal (hand-fired), 100; semi-bituminous coal (hand-fired), 97; coke (hand-fired), 95."

* Minerals Yearbook 1937

CONCLUSIONS:

That, from a long range standpoint, coal will become increasingly important, both in industrial use and in domestic heating, is fairly certain, especially in the light of present use of mechanical stokers. Consumption of crude oil is on such an enormous scale that it is a mathematical certainty that new domestic pools will not continue to be found of sufficient magnitude to maintain present reserves indefinitely. The inevitable result is that crude oil products will advance in price. As the price advances, coal is sure to enter more and more into competition with oil and to occupy a much more important part of the industrial picture than it does at present. This will be true in the field of industrial and household heating as well as in the eventual application of hydrogenation of coal in this country to supply the essential hydro-carbons now supplied by crude oil. The U. S. Bureau of Mines Minerals Yearbook for 1937 states, "The total German capacity for the production of gasoline by the hydrogenation of low-temperature tar, lignite, and bituminous coal was said to be about 800,000 metric tons* of gasoline per annum on January 1, 1937". -- "One hundred thousand tons of gasoline were produced from creosote oil, low-temperature tar, and bituminous coal by the hydrogenation plant of Imperial Chemical Industries at Billingham, England, during the first year of operation, ended May 1, 1936." --- "In Japan, a plant for the production of 50,000 tons of gasoline per year is being erected by the Chosen Coal Industry Co., another with 20,000 tons capacity is being constructed at Fushun by the South Manchurian Railway, a third of 10,000 tons capacity is being planned by the Japanese Electric Co. in North Sakhalin, and a fourth of 25,000 tons capacity by the Mitsui Co. at North Kiushu. In France, plants having a combined capacity of 50,000 tons of gasoline per year have been erected at Bethune and Lievin." --- The Canadian and United States Bureaus of Mines are operating small experimental plants for the continuous hydrogenation of about 100 pounds of coal per day, for determining the hydrogenation properties of North American coals".

Progress in the application of low temperature carbonization of coal is reported, especially in England and Germany where the recovery of primary tar is important in the production of motor fuels by hydrogenation. In the United States, the Minerals Yearbook reports that "The Briquetting Co., at Dickenson, N.Dak., has increased the capacity of its plant for the carbonization of lignite by the Lurgi process to 60,000-70,000 tons of briquettes per annum. The plant of the Pittsburgh Coal Carbonization Co. at Champion, Pa., using a modified Wisner process, ran continuously during the year, producing about twice as much smokeless fuel ("Disco") and byproducts as last year".

Concerning the use of pulverized coal used in large power plants, the same authority states: "The Trinidad power station of the Texas Light and Power Co. has operated successfully for the past ten years, using 100-percent lignite in pulverized form. Operating costs are said to have been favorable compared with fuel oil and natural gas during a period when there has been a

* Approximately 270,000,000 gals.

very large flush production of each within the state."

It is, therefore, evident that the Coos Bay coal field is potentially one of the State's valuable resources. At present, the field suffers from competition with other fuels, and the restricted local market precludes efficient, profitable mine operation and anything except crude methods of cleaning the coal. A wider outlet for this product would be of great benefit, not only to the present producers but also to all the communities adjacent to the Coos Bay area; and it is obvious that whatever benefits one locality of the state, benefits the state as a whole. This fact should be given consideration by fuel dealers in localities tributary to this field, and a retail dealer can have a large influence in promoting the sale of such a product as a low-priced fuel.

In the case of large users of fuel oil in the territory adjacent to the Coos Bay field, the well-being of the community should have a certain weight in the selection of the operating materials used where it is possible to have a choice. Finally, the time is apparently not so very distant when industries, now using oil for fuel, will be forced to give consideration to coal as a source of their fuel supply.

APPENDIX

STOKER TESTS ON COOS BAY COAL

BY NORTHWEST EXPERIMENT STATION
FEDERAL BUREAU OF MINES
Seattle, Washington

One-ton samples from the Southport and Alpine mines were taken in May, 1938, and shipped to the Northwest Experiment Station of the Federal Bureau of Mines at Seattle. The tests were made under the direction of Doctor H. F. Yancey, Supervising Engineer, and the following is his report; it includes also a tabulation of principal results:

The tests were made on an overfeed-type domestic stoker installed in a vertical, six-section, hot-water boiler such as is used for heating residences. The stoker and boiler, as well as the test procedure, are described in Bureau of Mines Report of Investigations 3379.

Two tests were made on each coal, one with the stoker feed-gate set for intermediate rate and the other at maximum rate; however, due to the coarseness of the two coals, the intermediate rate test on each coal corresponded to the minimum feed rate with other coals previously tested that had been crushed to a smaller screen size.

The appearance of the retort and the flame condition in the boiler were about the same with either coal. Both burned with a rather long, yellow, sootless flame, without visible smoke. Smoke-density readings taken during the tests, at the top of the chimney, showed an absence of smoke in all but Test 59, during which too small an amount of excess air was supplied. Even under this condition the smoke density was only 4 percent.

The chief difference in behavior of the two coals was in the character of the ashes produced. The coal from the Flanagan mine had an ash-softening temperature of 2170° F., and that from the Alpine mine softened at 2600° F. This difference was reflected in the character of the ashes obtained in the tests. Flanagan coal formed larger clinkers, which were more completely fused, than did the Alpine coal. The ashes obtained in the test on the Alpine coal were more friable and porous; such clinker as was formed was friable rather than glassy and occurred in smaller pieces than that from the Flanagan coal.

Inspection of the heat-balance statement shown in the tabulation reveals that a rather high recovery of useful heat was obtained with both coals despite their low heating values. An over all efficiency of 78.2 percent was obtained with the Flanagan coal when 12.1 pounds was burned per hour. At the maximum burning rate, 21.5 pounds per hour, the efficiency of the stoker and boiler was 69.5 percent. These efficiencies do not differ significantly from the corresponding values of 74.9 and 71.3 percent obtained with the Alpine coal.

Substantially the same efficiency could be obtained with either coal. The low heating value of the coals, of course, limits the output of heat that can be obtained on burning them. It is concluded that both coals could be used efficiently for house-heating purposes with equipment similar to that employed in conducting these trials.

Principal results of burning trials of two Oregon subbituminous coals with overfeed domestic stoker installed in hot-water boiler

Coal	Flanagan		Alpine	
Test No.	58	59	60	61
Feed rate, pounds per hour	12.1	21.5	12.6	21.7
Output, B.t.u. per hour	88,400	137,200	77,900	124,900
Analysis of coal, as fired				
Moisture, percent	17.2	17.1	17.7	18.7
Ash, percent	11.7	12.9	16.4	16.8
B.t.u., per pound	9,350	9,210	8,250	8,080
Ash softening temp., °F.	2,170	2,170	2,600	2,600
Heat balance, percent				
Efficiency	78.2	69.5	74.9	71.3
Losses:				
Combustible in ashes	4.6	9.4	7.0	7.2
Combustible in soot	.3	.4	.2	.2
Heat in dry flue gases	7.7	6.7	7.5	10.3
Combustible in flue gases	.0	4.4	.0	.0
Moisture and hydrogen in coal	6.6	6.7	7.0	7.5
Radiation and unaccounted	2.6	2.9	3.4	3.5
Total	100.0	100.0	100.0	100.0
Excess air, percent				
Coal fired	73	0.3	79.	64
Coal burned	82	12.	93	77