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Some Features of the Bering River Coal Field, Alaska

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SOME FEATURES OF THE BERING RIVER COAL FIELD, ALASKA.*

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INTRODUCTION.

The Bering River coal field lies a few miles inland from the north shore of Controller Bay, an indentation of the Pacific coast about 1,200 miles from Seattle. In this field are the Cunningham claims which were given much publicity in connection with the Pinchot-Ballinger controversy. Much of the coal area is within the drainage basin of the Bering River (Fig. 1). To the north of the field is the Martin River glacier, with the lofty, snowcapped Chugach range of mountains beyond; to the east of the field, and extending for many miles, is the Bering Pielmont glacier.

The coal field is accessible by launch and small boat from the village of Katalla, a calling port for passenger steamships. From Seattle to Katalla, by way of the "inside passage," is a voyage of seven or eight days; to Cordova, by the "outside passage," and thence to Katalla, is a voyage of about five days.

No railroad has yet been built into the coal field, although several surveys have been made, and some construction work has been done. Until a raiload has been completed and shipment has been made possible from the coast, the field will remain undeveloped. The chief difficulty in providing transportation facilities is the lack of good harbors on Controller Bay and adjacent parts of the coast. The waters are shallow and the coast storm swept. Many thousand of dollars have already been expended in an endeavor to form sheltered harbors, but it can scarcely be said that the efforts, thus far, have been successful. However, a deep water channel, extending into Controller Bay and protected by islands from the ocean storms has recently been mapped by the Coast Survey. It would seem from present evidence that, when a thorough knowledge of the coast has been obtained, the difficulties of securing suitable harbors will not be insurmountable.

*Sometimes named the Controller Bay Field or the Katalla Field.

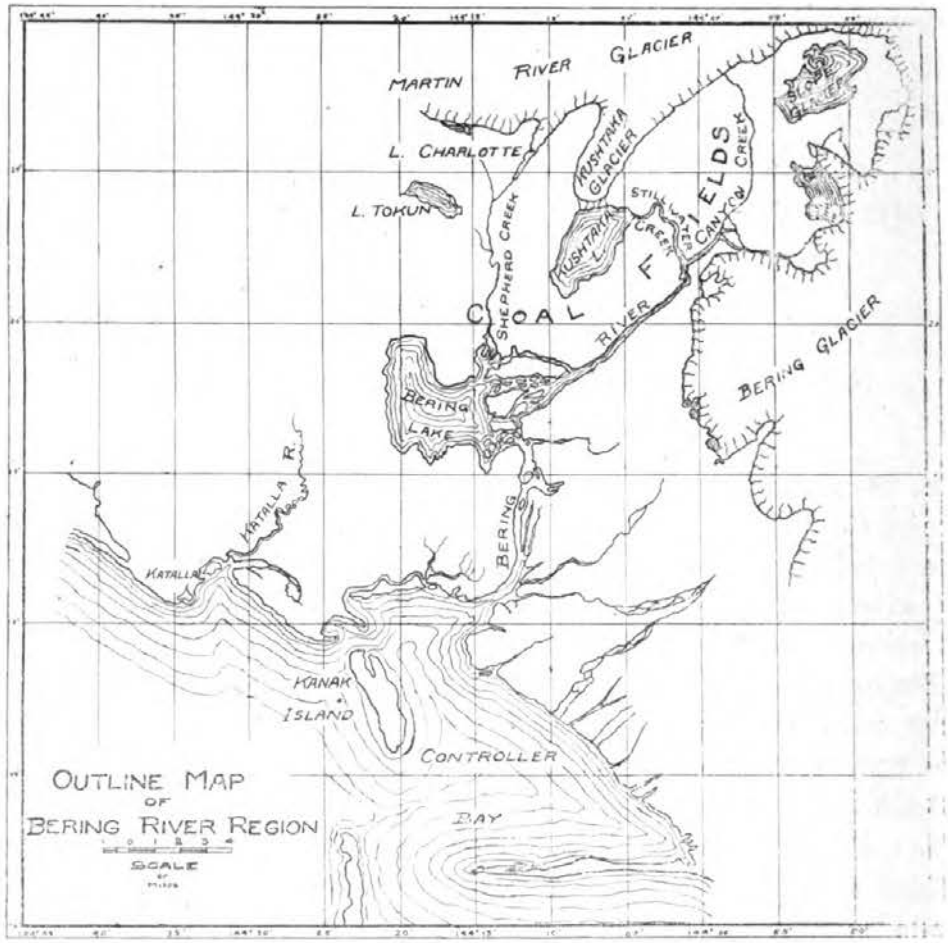

Fig. I. Some Features Bering River Coal.

The Copper River and Northwestern Railway Company, which has a railroad running northward into the interior from the splendid harbor of Cordova, has surveyed a branch line from this road to Katalla and thence to the coal field. The distance from the coal field to Cordova by this route is about 90 miles. Another route has been surveyed from the main line to the coal field by way of Charlotte Lake. By this route, the distance to Cordova is only about 60 miles.

The area within which coal has been found extends in a southwest northeast direction from Bering Lake to beyond Slope glacier, a distance of more than twenty miles. The width of the known coal formation is, in the northeastern part, more than five miles, but the average of the field is considerably less.

The chief areas applied for in this field include the following: Controller Bay group, Pittsburg group, Youngstown group, Rathbone and Aurora groups, Pacific Coal and Oil Company group or English Com-

pany group, Cunningham group, Chezum group, Wardell group, Hartline group, Alaska Petroleum and Oil Company group or Davis group, Willoughby group, the claims of the Portland Alaska Anthracite Coal Company, the Alaska Anthracite Coal Company, the McKenzie Anthracite Coal Company, the Carbon Mountain Anthracite Coal Company, and the Alaska Hard Anthracite Coal Company.

Almost all the field was located prior to November, 1906, at which time these coal lands were withdrawn from entry by the government. According to law each entry of 160 acres must have been made by an individual, or, at most, 640 acres by four individuals and in the interests of the entrymen. By an act of 1908, entries made in good faith under the previous law were allowed to be consolidated into single holdings not exceeding 2,560 acres of contiguous land. Many of the claimants have done considerable development work, have had their lands surveyed, have paid in ten dollars an acre to the government which is the requirement by law, and are now awaiting their patents.

The chief literature which has appeared on the Bering River field has been published in bulletins of the United States Geological Survey. A complete list of the articles which have been written by members of the survey and by others may be found in the bibliography of Bulletin No. 442 of the survey by Dr. A. H. Brooks. Of all the published reports that by Dr. G. C. Martin in Bulletin No. 335, entitled "Geology and Mineral Resources of the Controller Bay Region," is the most exhaustive. Accompanying this report are very satisfactory geologic and topographic maps. In an article by George W. Evans in the March, 1910, issue of Mines and Minerals, and also in an article by L. W. Storm in the Engineering and Mining Journal, Vol. 90, page 273, may be found maps showing the surveyed railway lines and the names and locations of the groups of claims which have been applied for in this field. A good Coast and Geodetic Survey chart of Controller Bay and adjacent parts of the coast is Chart No. 8513.

The Geography of the Region.

The topography of the area embraced by the known coal outcrops is rugged for a region of moderate relief. The elevations vary from a few feet above sea level at Bering Lake to somewhat more than 4,000 feet at the northeastern end of the field. The general trend of the ridges and mountains is northeast and southwest. A striking physiographic feature is the presence of broad valleys filled with alluvium and now occupied by comparatively small streams, except in times of flood. The numerous

small valleys are V-shaped, often canyon like; the slopes from the divides are usually steep and broken by many gulches.

The largest stream is Bering River, which takes its rise in the lakes at the margin of Bering glacier. Its chief tributaries receive their waters from the abundant rainfall and from the melting snows of Martin River glacier and its lobes. The tributary Canyon Creek, flows from beneath the margin of the glacier; Stillwater and Shepherd creeks drain lakes Kushtaka and Charlotte respectively. Both of these lakes are of glacial origin.

The precipitation of the region is probably in excess of 130 inches annually. The snowfall is very heavy. Above an elevation of 1,500 feet considerable snow is present even during the summer months.

The climate is not severe, the coldest weather recorded being 2° F. above zero. The average winter temperature is about freezing point, the average summer temperature between 50° and 55° F.

The slopes are usually timbered with spruce and hemlock to an elevation of more than 1,000 feet.

The Geology of the Region.

The chief rocks of the coal field consist of indurated sediments of Tertiary age, and of unconsolidated stream deposits, abandoned beaches, and morainal material of Quarternary age. Associated with the Tertiary sediments in the northeastern part of the fields are narrow dikes and sills of diabase and basalt, which are either Tertiary or post-Tertiary in age. The morainal deposits extend only a few miles beyond the present limits of glaciation.

The Tertiary sediments have been divided by Dr. Martin into three formations, the Stillwater, the Kushtaka, and the Tokun. The Stillwater is the oldest formation and consists chiefly of sandstone and shale with a thickness of about 1,000 feet. The Kushtaka overlies the Stillwater conformbly and is that part o fthe Tertiary which contains the beds of coal. It has a thickness of about 2,000 feet, made up of coarse arkose, sandstone, shale, and beds of coal. Complete sections of the formation are not well exposed, and hence the number of seams of coal is not well known. The evidence suggests more than a dozen seams varying in thickness from 6 inches to more than 35 feet. The Tokun formation overlies the Kushtaka conformably, and consists of about 2,500 feet, chiefly of sandy shales, but containing also, sandstone and a subordinate amount of limestone. All the evidence thus far found indicates that the Stillwater formation is marine, the Kushtaka non-marine and the Tokun marine.

The Structure of the Coalfield.

The structure of the rocks of the coal field is, in general, monoclinal, the most prevalent strike being northeast; the dips are usually steep to the northwest. The main topographic features of the region have a general northeast-southwest trend and are related, in a broad way, to the structure. But detailed study of small areas within the field emphasizes very clearly that the structure is much more complex than is indicated by a general study of the field. This complexity is due to folding, to faulting, and, in the northeastern part of the field, to associated igneous rocks. Apart from a few well defined lines of faulting with northeasterly and southwesterly trend, there are many small faults running in vairous directions. Moreover, within small areas in the field the srtikes and dips are aften irregular. The rocks are frequently very much broken and jointed, and slickensided surfaces, especially in the coal, are common.

The complex structure was produced by the intense crustal movements to which the rocks were subjected during late Tertiary or post Tertiary time. Recent subsidence of the region is indicated by the presence of alluvial deposits, in places several hundreds of feet in thickness, in the broad valleys now occupied by comparatively small streams.

The Coal.

The coal beds are restricted to the Kushtaka formation, which has a known surface area of about fifty square miles. The evidence is fairly clear that an additional area of more than twenty square miles underlies the Tokun formation at varying depths. The coal beds are distributed throughout the thickness of the Kushtaka formation. Where sections of the formation are the best exposed more than a dozen seams of coal may be seen but several of these are thin and unimportant. In places the coal beds have thicknesses of more than twenty-five feet of good coal; at many places beds exceeding ten feet may be seen. Owing to the complexity of structure, and the small amount of development work, it is impossible to correlate the coal beds in one part of the field with those of other parts, even when the outcrops are not widely separated. The thicknesses of the beds often vary greatly within short distances along both the strike and the dip. In some places the evidence suggests that the irregularities in thickness are due to movements, the coal having been squeezed into great pockets of irregular shape. Moreover, in some places there is a somewhat abrupt change from a bed of good coal of considerable thickness into coal of a much lower grade, or into carbon-

aceous shale. In some places the movements have resulted in the coal being intimately mixed with the rocks of the roof and the floor. The roof and the floor are most commonly of shale. One sometimes finds the roof to be of shale and the floor of sandstone, or vice versa; in a few places sandstone forms both the roof and the floor. The roof is frequently fractured to such an extent that, in mining, timbering will be necessary.

The coal of the region is of good quality, the best grade being anthracite, the lowest grade semi-bituminous. The average of 32 analyses of samples of coal taken by Dr. Martin so as to represent the coals of the whole field was as follows:

	Per Cent
Total moisture	6.02
Volatile combustible	10.44
Fixed carbon	75.30
Ash	8.23
Sulphur	1.47

The fuel ratios of these coals varied from 3.61 to 15.88, the average being 7.78. The highest B. T. U. value was 15,574, the lowest 8,386, and the average of the 32 analyses was 13,174. The average analysis of 7 of the coals which were classed as anthracite was:

	Per Cent
Moisture	7.88
Volatile combustible	6.15
Fixed carbon	78.23
Ash	7.74
Sulphur	1.30

The semi-bituminous grade of coal is found in the southwestern part of the field, the anthracite in the northeastern. Between these two areas the grade of coal is intermediate between semi-bituminous and anthracite. The distribution in the grades of coal corresponds somewhat closely to the complexity of structure in the different parts of the field. The structure becomes more and more complex from the southwest toward the northeast. The grade of the coal has been made better with an accompanying complexity of structure.

The semi-bituminous coal has been shown to possess good coking properties.

A striking feature of the coals, and one which is likely to be a serious handicap to their utilization, is their crushed and sheared condition. In many of the surface exposures and in the tunnels, drifts, and open cuts, where development has been carried on, the coal is soft and friable.

even where fairly firm and unbroken masses of coal are found, they can be readily crushed. It is difficult to find large lumps of coal free from fractures and slickensided surfaces. When being mined, such coal cannot escape being badly broken, and the difficulties of shipping will be great. In the case of the anthracite, the crushed and friable condition is likely to impair seriously its market value. With regard to the grades of coal of coking quality, the soft character may not be serious in that the coal can be converted into coke before shipping. It is scarcely probable, in a region where the crustal movements have been so widespread and intense, that the coals below the zone of surface disintegration will be free from the crushed and fractured conditions which are so prevalent at and near the surface.

Gas has been found in several of the tunnels, hence, in mining, safety devices will be necessary.

Development.

At more than three hundred places within the field, more or less development work has been done. But no extensive mining has been carried on. The most prevalent kind of work consists of small surface openings. However, more than thirty drifts or tunnels have been run with an aggregate length of more than three thousand feet. The most systematic development work has been done on the Cunningham, the Controller Bay, the English Company, and the Davis groups. On the Cunningham claims several long tunnels have been run. At the McDonald mine on the Controller Bay group is a working drift more than six hundred feet long. On the claims of the English Company there are three tunnels with a total length of more than nine hundred feet. On the Davis group is a tunnel of more than five hundred feet. During the summer of 1910, the Davis group was the only one in the field upon which systematic development work was being carried on.

Summary and Conclusions.

The coals of the Bering River field are of good quality and the tonnage is unquestionably great. But the probable amount of this coal which is avaiable at present or which will be available in the near future cannot be stated with any degree of reliability. The conditions of occurrence are such that, until extensive development has revealed many data at present unknown, an estimate of the available coal would be little more than a guess. In coal fields of somewhat simple structure, fairly reliable estimates may be made of the available coal from a study

of the outcrops, but in fields such as the Bering field, where the structure is complex, such estimates are of little value and, in fact, they may be harmful. The figures are likely to be overemphasized and even misused by those who are endeavoring to interest the investing public. In much of the Bering field the rocks are folded, faulted, jointed and crushed, the coal beds are known to vary much in thickness within short distances along both the strike and the dip, the coal beds in several places may be seen to change somewhat abruptly into carbonaceous shale, and in places they are intruded by igneous rocks. As yet, the beds in the different parts of the field have not been correlated, nor is it possible to state the number of beds which are workable. Moreover, when it is recalled that gas is present in the coals, that the region is one of great rainfall, that the snowfall is heavy, that the coals are in many places friable, that many difficulties and large expenditures are connected with the problem of railroad construction and the providing of docking facilities, one begins to realize how necessary it is to give full weight to these facts in reaching a conclusion as to the value of the field.

The opening up of this field would be a great boon to Alaska and to the states of the Pacific coast. The government should do all in its power to hasten its development. In cases where the evidence shows that the entrymen have conformed with the law, the patents should be issued without delay. Moreover, the present unsatisfactory laws should be revised. The laws should be such that development will be encouraged not discouraged. Not until large sums of money have been invested in this field will it be possible to mine and ship the coal on a commercial scale.