LETTER OF

R.D. GEORGE

STATE GEOLOGIST

THE DENVER AND SALT LAKE RAILROAD

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R. D. GEORGE

State Geologist of the State of Colorado

Transmitting economic maps,
prepared under his direction, of the region served
and to be served by

THE DENVER & SALT LAKE RAILROAD

(*Moffat Road*)

and transmitting a statement prepared
by him about the

Coal, Oil Shale, Hydrocarbon and other mineral deposits of economic value in that region

Published by

W. G. EVANS W. N. W. BLAYNEY JAMES A. McILWEE
Special Committee of The Denver Civic and Commercial Association
DENVER, COLORADO

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BROCK-HAFFNER PRESS, DENVER

MAP SHOWING PROPOSED MOFFAT ROAD MAIN RANGE TUNNEL AND EXISTING RAILWAY LINES IN REGIONS WEST OF DENVER AND EAST OF SALT LAKE

Projected Moffat Road Extensions and Main Range Tunnel indicated by Red lines.

DISTANCE BETWEEN DENVER AND:

SULPHURSPRINGS	108 MILES	CRAIG	254
ORESTOD	151 "	PROVO	537
STEAMBOAT SP'GS	214 "	SALT LAKE CITY	578

DISTANCE TO ALL POINTS REDUCED 23 MILES UPON COMPLETION OF MAIN RANGE TUNNEL.

COMPARISON OF DISTANCES BETWEEN DENVER AND DOTSERO

Via Denver & Rio Grande Railroad.....343 miles

Via Denver & Salt Lake Railroad (Moffat Road), projected Dotsero cut-off and projected Main Range Tunnel.....170 miles

MILEAGE BETWEEN DENVER AND SALT LAKE CITY

VIA	UNION PACIFIC R.R.	628 MILES
	D.&R.G.R.R.	745 MILES
	"MOFFAT ROAD"	578 MILES

MOFFAT ROAD, DOTSERO CUT-OFF, D.&R.G.R.R. ....578 MILES. (TUNNEL COMPLETED)

Colorado Geological Survey
R. D. GEORGE
STATE GEOLOGIST

UNIVERSITY OF COLORADO
BOULDER

June 11, 1918.

W. G. Evans,
W. N. W. Blayney,
James A. McIlwee.

Special Committee of the Denver Civic and Commercial Association.

Sirs:—

Replying to your request for a statement from the State Geologist of Colorado concerning the extent and location of the deposits of coal, oil shales, hydrocarbons, and other minerals of economic value, in the region served and to be served by the Denver and Salt Lake Railroad—the statement to be used by your Committee to make clear the public advantage and public necessity for the completion of the Denver and Salt Lake Railroad—the "Moffat Road"—and its main range tunnel:

I am returning herewith the map of the railroad handed me by your Committee and showing the "Moffat Road" as already constructed, the proposed extensions of the railroad, and the location of the main range tunnel. I am submitting to you, also, two maps prepared in my office. Upon one of them are shown the coal deposits of the region, and upon the other of them are indicated the oil-shale and hydrocarbon deposits, and the deposits—so far as known—of other minerals of economic value. I am also submitting a statement, prepared under my direction, concerning the resources indicated upon the maps referred to.

It is apparent to me, from a careful examination of the subject, that the industrial value of many million dollars' worth of useful mineral deposits depends largely upon the quick completion of the railroad enterprise, including the proposed tunnel through the main range.

The United States owns the largest proportion of the coal and oil-shale lands, and of lands containing other deposits of economic value, in the region

mentioned. In that district the State of Colorado owns many thousand acres of lands underlaid with workable veins of coal. There are many thousand acres of cultivable lands, and wide areas of grazing lands, in that region, which will be brought into usefulness by the completion of this necessary transportation enterprise—the "Moffat Road"; so that the public interest is involved to the extent of many millions of dollars, aside from the general public interest represented by the need for the coal of that region and by the need of the people already settled in that region for dependable transportation.

If the maps and statements furnished you herewith do not convey all the information you require from my office, I shall be pleased to supplement them with a statement of any further facts, the knowledge of which is in our possession.

Yours truly,

R. D. George

State Geologist.

Resources of the Country Tributary to the Denver & Salt Lake Railroad "Moffat Road"

Resources of the Country Tributary to the Denver & Salt Lake Railroad

Numerous mineral deposits of widely varying character occur in those parts of Northwestern Colorado, and Northeastern Utah, tributary to the Denver and Salt Lake Railroad ("Moffat Road") and the proposed extension of that road westward to Salt Lake City.

The "Moffat Road" and its proposed extension lies about midway between the Union Pacific and the Denver and Rio Grande Railroads, and would serve a practically undeveloped country, whose rich mineral resources are not only large, but whose development has been prohibitive under the present facilities of transportation.

A great many articles have been written by individuals dealing with the various resources along this proposed route, while the United States Geological Survey, the United States Bureau of Mines, and the Colorado Geological Survey have contributed detailed reports on various areas throughout the region. These reports are readily accessible, and will give the reader the information gained, data gathered, and conclusions reached as the result of careful investigations in the various districts.

On account of the extreme size of the region which must be traversed by the proposed route, only scattered districts have been gone over in detail, while many other districts have not even been prospected, little being really known of the future possibilities of the region, aside from the fact that each year records the discovery and development of new resources, or the development of previously discovered resources to meet the present demands for those materials.

Many of these deposits are really inaccessible at present, but through the building of the proposed route they would become readily available, some without any haul whatever, they being directly along the proposed route, while others would have to be hauled comparatively short distances, in practically every case over roads easily accessible by auto truck. At present, hauls of from 60 to 90 miles make the development of very good mineral deposits impracticable, because of the cost of transportation, and the small tonnage that can be marketed under this system.

Many of the owners of mineral property in that district are now simply trying to hold their properties, in hopes that the future will bring an exten-

sion of the road, and that they will be able to develop their deposits and market the product at a profit instead of at a loss, such as present operations now usually result in.

ASPHALT

A number of deposits of asphaltic nature occur in that district which lies between Soldier Summit, Utah, and the Utah-Colorado line. These deposits lie mainly in the so-called Uintah Basin, which the "Moffat Road" must traverse from east to west, and represent various types of solid hydrocarbons, such as wurtzilite, uintaite (gilsonite), nigrate, grahamite, elaterite, ozokerite, asphaltic sands, gilsonitic shales, and maltha. No attempt will be made to classify these various deposits, for in the Uintah Basin they are all known as gilsonite, although a number of different forms do occur.

Deposits of ozokerite are known to exist in Wasatch County, near Soldier Summit and Colton. During the latter part of 1916 they were opened up by the Wasatch Ozokerite Company, now the American Chemical and Ozokerite Company of Chicago, and some 7,600 pounds were shipped to their chemical plant near Chicago, where it was refined, placed on the market, and found a good demand as an electrotyper's wax, being of good quality.

Deposits of wurtzilite occur in Indian and Lake Canyons, tributaries of the Duchesne River, which enters that stream from the south, near the west edge of the Uintah Basin. These deposits have never been developed to any great extent, so their possibilities are not known.

Three miles east of Fort Duchesne, near Moffat, Utah, a large vein of so-called gilsonite, having a width of up to 4½ feet, may be traced a distance of 2 miles along its course. It maintains a width of from 3 to 4 feet throughout a distance of 1½ miles, where it has been opened up and worked in places to a depth of 200 feet.

A smaller vein of the same hydrocarbon is located about three-quarters of a mile to the west and may be traced in very nearly the same direction as the larger vein (N. 40° W.). This vein has been worked north of Fort Duchesne, and is being worked spasmodically at present on account of the increased price, which aids in paying the large transportation costs.

Other veins in this same general district are the Culmer vein southwest of Ouray and a number of small veins in the immediate vicinity of Ouray. These have all produced at one time, but are not being worked at present.

In the White River district the Bonanza and Cowboy veins are the most

important, having produced considerable tonnage. The Cowboy vein is the largest in the district, having a length of up to 7 or 8 miles, with a maximum width of 18 feet, the average, however, being much less.

Just across the Utah-Colorado line in Colorado, a vein of gilsonite is traceable for some distance. This vein has the same course as the Bonanza vein, but has not been developed to any considerable extent.

The above veins are not being worked at present, but such shipments as are made must be sent by wagon or auto truck to Watson, Utah, where they are shipped over the Uintah Railroad (narrow gauge) to Mack, Colo. At Mack the gilsonite, which is shipped in sacks, is transferred from the narrow-gauge cars of the Uintah Railroad to the standard-gauge cars of the Denver and Rio Grande Railroad. This haul is costly, as it requires the crossing of Baxter Pass and a transfer at Mack, Colo., all serious points when developing mineral deposits which bring none too high a price under the best conditions.

Several large veins occur in the vicinity of Watson and Dragon, Utah. The best known are the Black Dragon, Rainbow, and Harrison veins. The Black Dragon and Rainbow veins are being worked at present, and a considerable tonnage is shipped over the Uintah Railroad. The veins are both very large and the gilsonite (?) can be mined at low cost and good profit, partly because of transportation facilities which are so readily available.

One deposit of grahamite is located on upper Willow Creek, north of Granby, Grand County, Colorado. A considerable amount of this material has been hauled to Granby and shipped from there to eastern points.

It has been estimated by the United States Geological Survey that the tonnage of the Cowboy, Bonanza, Black Dragon, and Duchesne veins is as follows:

Cowboy vein	14,069,250 tons
Bonanza vein—	
East branch	10,434,387 "
West branch	4,084,497 "
Black Dragon vein	2,086,479 "
Duchesne vein	470,958 "
Total	31,145,571 tons

Twenty-second Annual Report—United States Geological Survey—Part I, page 352—Geo. H. Eldridge.

These figures are based on conservative estimates from data actually collected in the field, and represents only a part of the total tonnage which might be produced in the district.

Gilsonite is employed chiefly in the manufacture of black varnishes and paints, but it would be hard to enumerate all of the various uses which are so very extensive. Chief among these uses are the following, according to statement of E. W. Parker, in the Mineral Resources of the United States Geological Survey for 1893:

1. For preventing electrolytic action on the iron plates of ship bottoms.
2. For coating barbed wire fencing.
3. For coating sea walls of brick, masonry and concrete.
4. For covering paving brick.
5. For acid-proof lining for chemical tanks.
6. For roofing pitch.
7. For insulating electric wires.
8. For smokestack paint.
9. For lubricants for heavy machinery.
10. For preserving iron pipes from corrosion and acids.
11. For coating poles, posts, and ties.
12. For toredo-proof pile coating.
13. For covering wood-block paving.
14. As a substitute for rubber in the manufacture of cotton garden hose.
15. As a binder pitch in making briquettes from coal.
16. For low-grade brush and dipping varnishes.
17. For high-grade rubbing varnishes for coaches and machines.

(In 1916, out of 15 briquetting plants in the United States, 7 were using asphaltic pitch as a binder and 3 were using coal tar and asphaltic pitch.)

There are many new uses for this same material, of which there is such an immense tonnage in the Uintah Basin, Utah, and in Northwestern Colorado.

During 1916 there was produced in the Uintah Basin, Utah, 27,134 tons of gilsonite, having an average price of $22.05 on the railroad. This tonnage was increased in 1917, and brought a much better price than in 1916.

ASPHALTIC SANDS

Immense deposits of asphaltic sands occur in the vicinity of White Rocks, on Upper Deep Creek, and in the Asphalt Ridge west of Vernal, Uintah County, Utah, all in the Uinta Basin.

Plans are being formulated at the present time for the erection of a refinery to treat the asphaltic sands or sandstone near White Rocks. These deposits are extremely large and can be traced for several miles to the east towards Deep Creek, where, although no development work has been done, at least four beds from 5 to 14 feet in thickness appear to be well saturated with asphaltic material. The material west of Vernal has been used for some time past in the making of sidewalks in Vernal, and has been well adapted for that use. Other asphaltic sand areas have been reported, but the exact location, size, and possibilities of production are unknown at present.

One of the most important needs of the country at the present moment is material suitable for the building of roads. This need is very urgent, and samples of these asphaltic sands which have been sent to Eastern cities have brought favorable reports, showing that they were very well suited and desirable for road-building purposes. These reports have been accompanied by requests for large amounts of the sands, but could not be complied with, in spite of the extremely large size of the deposits, because of the excessive costs of transportation, as shipment would have to be made by wagon or auto truck to Watson or Price, Utah, 75 and 80 miles distant.

CARNOTITE

This ore of uranium and vanadium has been found on Coal Creek, northeast of Meeker, Rio Blanco County, Colorado; on the south foot of Blue Mountain, about 2 miles west of Skull Creek, an east fork of Red Wash, Moffat County, Colorado; about 10 to 12 miles southwest of Green River, Utah, near the San Rafael Swell; 45 miles south of Green River, Utah, at Table Mountain, and 16 miles southeast of Thompson, Grand County, Utah, besides numerous other deposits south and southeast of these latter named localities. The first two deposits named are tributary to the "Moffat Road," the other being south of the Denver and Rio Grande in Utah and tributary to that road.

This ore is the main source of both uranium and vanadium, which are very much in demand at present, and will continue to be in the future, because of its general usefulness in the various arts.

Metallic uranium and uranium carbide are used in the steel industry to increase the toughness, hardness, and elongation of steel for various purposes and for high-speed tool steel. It is also used in the mantles of incandescent gas lamps, together with various other elements, and in the filaments of electric lamps. Various uranium salts are used in iridescent glass and pottery glazes, in porcelain painting, calico printing, medicine, and chemical determinations.

Uranium salts are radio active and carnotite furnishes one of the chief sources of our radium supply.

Vanadium is very important in the steel industry, where it is used extensively in the manufacture of springs, axles, crank shafts, gears, wheels, and high-speed tool steel, because of the fact that it resists fatigue, or crystallization, a very valuable and desirable quality. It is employed in the arts in many ways, such as the following:

1. Chemistry.
2. Catalytic agent in the manufacture of sulphuric acid.
3. Photography.
4. Glass and porcelain coloring.
5. Dyeing silks and fabrics.
6. Oxidizing agent.
7. Reducing agent in organic compounds.
8. Manufacture of bronzes.
9. Manufacture of permanent inks.
10. Medicine.

The source of a steady supply of ores will widen the field of use and increase the demands for this mineral. The further development of some of these deposits, at least, will depend on transportation facilities, such as will be attained through the development of the proposed extension of the "Moffat Road."

CLAY

Deposits of fire clay have been opened at Plastic, Jefferson County, Colorado, and have been worked to some extent, while the clays and shales in the district near Arvada, Jefferson County, Colorado, have aided in the development of a considerable brick industry, these products being marketed in Denver and the eastern part of Colorado.

COPPER

Copper occurs as the principal ore in a number of different districts throughout Northwestern Colorado and Northeastern Utah, but a majority of the deposits have had so little development that their real possibilities are not known.

The Bingham district, located in Bingham Canyon, some 25 miles southwest of Salt Lake City, has been instrumental in placing Utah third in the list of copper-producing states. This district showed previous to January 1, 1917, the development of 424,524,258 tons of ore, with reserves on January 1, 1917, totaling 369,845,558 tons of ore, averaging 1.41% copper, and a total production during the year 1916 of 223,619,609 pounds of copper.

The Tintic district in Utah produced the second largest amount of copper, a total of 7,106,645 pounds; Tooele County, 2,836,678 pounds; and Park City, 1,512,578 pounds.

These great deposits produced an even greater tonnage during 1917, and in the case of all the districts, but more especially the Bingham district, even greater ore bodies were being developed and the reserves added to. This copper finds a market in the East as well as the West, and the coal supply for the great furnaces at Garfield, Murray, and other localities must be obtained from along the Denver and Rio Grande Railroad and the Union Pacific. Those great coal fields along the "Moffat Road" and its proposed extension, because of their inaccessibility, have not been called upon to fill any of the demands of this district.

Other deposits of copper which show promise, but lack development, are located at Blue Ledge, 5 miles west of Heber, Wasatch County, Utah, and at Mona, Juab County, Utah. Colorado deposits are located at Monarch, Grand County; Pearl, Jackson County; Rock Creek (Gore Range) and Radium, Grand County; Oak Creek (Red Gorge), Copper Ridge (9 miles northwest of Steamboat Springs), Spring Creek (Steamboat Springs), and Elk Horn (Three Forks-Slater), all in Routt County, Colorado.

A very likely and partially developed district from which some ore has been shipped, and additional material will be shipped during the coming summer (90 miles to Craig, Colo.), is located on the slopes of Douglas Mountain, near the Colorado-Utah line in Moffat County, Colorado. This property has been hindered in its development because of the long haul, and especially during the winter months, when snow makes the cost of hauling the ore 90 miles prohibitive.

The Unaweep copper district, as described in Bulletin 530 of the United States Geological Survey, is located 12 to 13 miles west of White Water, on the Montrose branch of the Denver and Rio Grande Railroad. This district has possibilities which have not been fully developed up to the present time.

COAL

The main coal areas of Northwestern Colorado and Northeastern Utah lie along the "Moffat Road" (and its proposed extension) and the Denver and Rio Grande Railroad, or in that area between the two roads. The various districts may be spoken of, and have been described under the following names, of which this is an incomplete list:

1. YAMPA COAL FIELD.
   Upper valley of the Yampa River in the region of Steamboat Springs.

2. DANFORTH HILLS AND GRAND HOGBACK.
   Located in Moffat, Rio Blanco and Garfield Counties.

3. COAL FIELDS OF NORTHWESTERN COLORADO AND NORTHEASTERN UTAH.
   This includes the western Yampa, lower White River, and Vernal coal fields, located in Rio Blanco and Moffat Counties, Colorado, and in Uintah County, Utah.

4. DEEP CREEK COAL FIELD.
   Located on upper Deep Creek, west of Vernal and north of Ft. Duchesne, Uintah County, Utah.

5. BLACK TAIL MOUNTAIN COAL FIELD.
   Eastern Wasatch and Western Duchesne Counties, Utah.

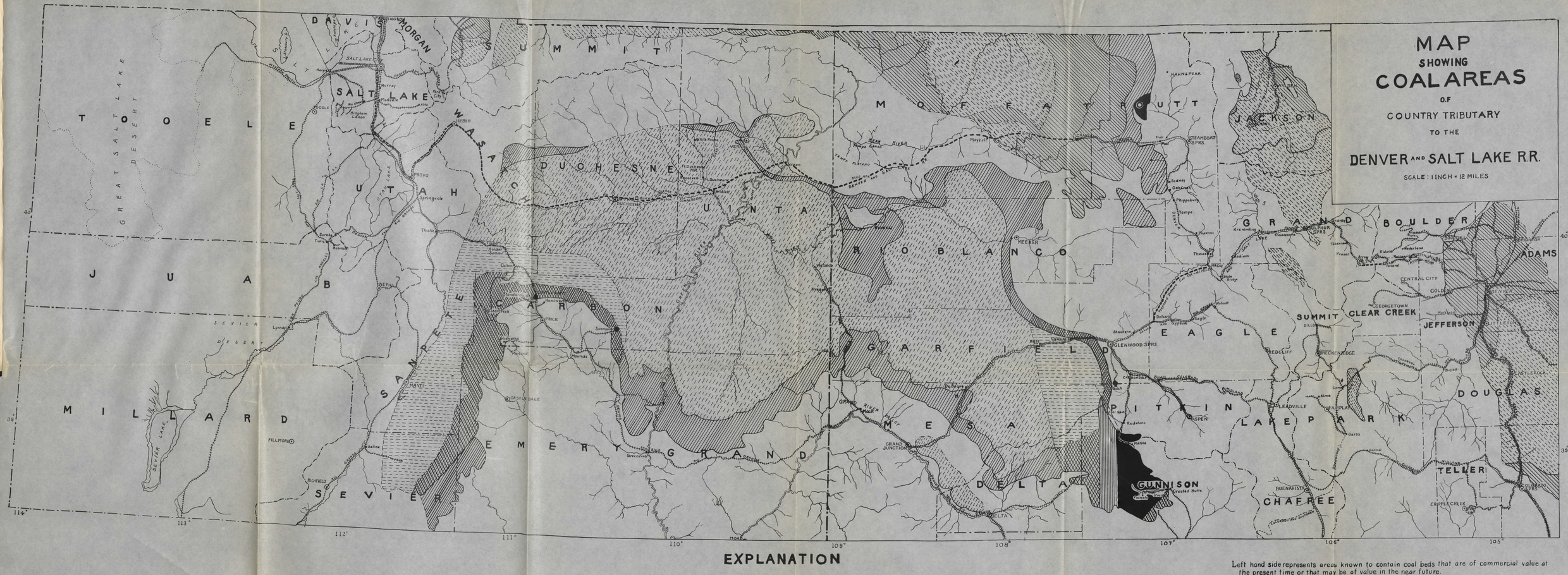
These fields are crossed or lie in territory near the route of the "Moffat Route."

6. THE GRAND MESA AND WEST ELK MOUNTAIN COAL FIELD.
   This includes the Palisade, Rollins, Gunnison, Somerset, Coal Creek, Mt. Carbon, Floresta and Crested Butte Fields, lying east and north of the Gunnison River.

7. THE BOOK CLIFFS COAL FIELD.
   This lies north of and parallels the Denver and Rio Grande Railroad from Grand Junction to Castle Gate, Utah.

8. THE WEBER RIVER COAL FIELD, UTAH.

9. PLEASANT VALLEY COAL FIELDS.
   Located in Carbon and Emery Counties, Utah.


MAP
SHOWING
COAL AREAS
OF
COUNTRY TRIBUTARY
TO THE
DENVER AND SALT LAKE R.R.
SCALE: 1 INCH = 12 MILES
EXPLANATION
Anthracite coal
Not Used.
Semibituminous coal
Not Used.
High-grade bituminous coal
(12,500 or more B. t. u. on air-dried sample)
Low-grade bituminous coal
(Less than 12,500 B. t. u. on air-dried sample)
Subbituminous coal
Coking coal
(Coal coked at the present time, or coal that has been coked in the past)
Railroad
Proposed Railroad
County Seat
Left hand side represents areas known to contain coal beds that are of commercial value at the present time or that may be of value in the near future.
Right hand side denotes areas of doubtful value for coal.
(1) Areas containing coal-bearing formations in which little coal is known.
(2) Areas containing thin or irregular coal beds which generally have little or no value but which locally may be thick enough to work.
(3) Areas in which the coal-bearing formations are under cover, This may vary from a few hundred to as much as 10,000 feet.
TOOELE
DAVIS
MORGAN
SUMMIT
MOFFAT
ROUTT
JACKSON
SALT LAKE
UTAH
WASATCH
DUCHESNE
UINTA
RIO BLANCO
GRAND
BOULDER
ADAMS
JUAB
CARBON
GARFIELD
EAGLE
SUMMIT
CLEAR CREEK
JEFFERSON
MILLARD
SANPETE
EMERY
MESA
PITKIN
LAKE
PARK
DOUGLAS
SEVIER
DELTA
GUNNISON
CHAFFEE
TELLER
GREAT SALT LAKE DESERT
SEVIER DESERT
SEVIER LAKE
SALT LAKE
OGDEN
PROVO
PRICE
VERNAL
MEEKER
GLENWOOD SPRS.
LEADVILLE
ASPEN
GRAND JUNCTION
DELTA
FILLMORE
MANTI
CASTLE DALE
RICHFIELD
MOAB
BUENA VISTA
CRIPPLE CREEK
114°
113°
112°
111°
110°
109°
108°
107°
106°
105°
40°
39°

YAMPA COAL FIELD

This area lies along that part of the present "Moffat Road" which extends as far west as Craig, Moffat County, Colorado. It covers an area of about 1,200 square miles and from estimates of the United States Geological Survey, has a probable available tonnage of 39,000,000,000 tons. This coal area comprises that district from the Elk Mountains southward to Yampa, and west to the Yampa River near Hamilton.

In the northern part of the district, around Pilot Knob and Wolf Mountain (20 miles northwest of Steamboat Springs), is an area of Anthracite Coal possibly 25 square miles in extent, with a known area of 10 square miles.

The following statement, which has been proven to be quite true, was made in Bulletin 285 of the United States Geological Survey on the Yampa Coal Field by N. M. Fenneman and Hoyt S. Gale: "The prospect of a railroad through the center of the area has in recent years stimulated exploration and careful study. It seems almost certain that with more adequate transportation facilities, the Yampa Coal Field will become an important factor in the supply of the western market. The coals are for the most part a good grade of bituminous, and anthracite of good quality is known to exist, within a certain limited area."

During 1917, 19 mines were working in the Yampa Coal Field Area in Routt County, and one was working in Axial Basin, Moffat County. These mines and their operation were hindered greatly during the past winter, through the inability of the "Moffat Road" to keep open its line, due to snow troubles on the Continental Divide, over which the "Moffat Road" must now pass. As a result of the poor service given the producer in Routt County, many of the mines were forced to close down, and others lost large numbers of their men, because of the uncertainty of working conditions. This hampered the district greatly, and will have a bad effect until such conditions can be remedied permanently.

The total output of the district during 1917 was 1,057,685 tons against 919,895 tons produced in 1916.

The coal produced in the other districts along the "Proposed Moffat Road" was barely sufficient to take care of the demands for coal for domestic purposes, and no estimate can be obtained of the amount mined.

The coal areas of Northwestern Colorado and Northeastern Utah, included in Moffat and Routt Counties, Colorado, and Uintah County, Utah, are of

bituminous coal of a good grade. Mines near the town of Vernal, Utah, produce enough to supply the local demand of coal for domestic purposes.

BLACK TAIL MOUNTAIN

This coal field, which has not been developed because of the lack of transportation facilities, is about 150 square miles in extent. It contains a good low-grade bituminous coal which has good stocking qualities, but is non-coking in character. The estimated tonnage of this field is placed at 1,857,600,000 tons, while that of the Deep Creek Field to the east is placed at 35,000,000 tons.

DEEP CREEK FIELD

The Deep Creek Field is located on upper Deep Creek, west of Vernal and north of Fort Duchesne, Utah. The field covers about 25 square miles, and produces a low-grade bituminous coal. Several Government Mines formerly produced a small tonnage which was used at Fort Duchesne before that post was abandoned.

DANFORTH HILLS AND GRAND HOGBACK

This district, which extends from Moffat County, through Rio Blanco and into Garfield, lies between the "Moffat Road" and Denver and Rio Grande Railroad tracks. The field is productive of a good bituminous coal and will yield a good tonnage when transportation facilities are obtained. The Danforth Hills coal area covers 300 square miles and the Grand Hogback about 75 square miles.

GRAND MESA COAL FIELD

The Grand Mesa, which covers an area of 550 square miles of productive coal measures, has an available production of 14,881,703,160 tons of low-grade bituminous coal.

The tonnage mined is transported west to Grand Junction and then east without transfer. This is a roundabout way, but if taken to Montrose it would have to be transferred to narrow-gauge cars, and retransferred again at Salida to standard-gauge cars.

BOOK CLIFFS

The coal-bearing measures of the Book Cliffs can be traced for 500 miles from Mt. Hilgard, Utah, to Grand Junction, Colorado. The coal measures cover some 1,010 square miles, some 360 square miles being found in Colorado.

The estimated available tonnage when mined, is placed at 6,005,000,000 tons. The coal is a low-grade bituminous until just east of Sunnyside, Utah, a good high-grade bituminous coal is found. This high-grade bituminous coal continues from Castle Gate southward through Carbon and Emery Counties, Utah, an area which is easily available as development increases the demand for transportation.

Good coking coal is found at Castle Gate and Sunnyside, Utah, and at Gulch, Colorado, where a considerable quantity is being used for that purpose.

The main markets for the coal of this entire district are in the middle west and the far western states. That being shipped towards the far west will find an outlet over the Denver and Rio Grande and "Moffat Road," if the proposed extension is built. That being shipped east over the "Moffat Road" must be hauled over the Continental Divide and down to Denver. That shipped over the Denver and Rio Grande or Colorado Midland Railroads must reach an apex in their haul on the Continental Divide and again at Palmer Lake, south of Denver.

By the building of the Dotsero cut-off and Moffat Tunnels, as has been proposed, the distance would be *greatly shortened* and at no place would there be a maximum grade of over 2 per cent to contend with, while snow conditions such as would block traffic would be brought to a minimum.

The respective lengths of the various railroads from Denver to Grand Junction would be as follows:

"Moffat Road"	280.0 miles
Colorado Midland	384.0 miles
Denver & Rio Grande	449.6 miles

This together with the smaller grades would cause a big saving in coal haulage eastward from all points on the Denver and Rio Grande, Colorado Midland and Moffat Roads.

The total available tonnage of Northwestern Colorado and Northeastern Utah is in excess of 65,000,000,000 tons, which is marketable over the Moffat and Denver and Rio Grande Railroads.

GOLD

A large number of districts throughout Northwestern Colorado and Northeastern Utah have been productive of gold during the past or are producing at present.

The Mineral Resources for 1916 gives the following production in Utah in that territory adjacent to the proposed "Moffat Road":

Salt Lake County	$2,513,096
Bingham	2,490,158
Juab County	856,474
Tintic	855,454

Other deposits which have been only partially developed, and from which no considerable tonnage has been shipped, are located at Carbonate (Uintah County), Green River (Cub Creek, Uinta County, where stream gravels have been placered), North Fork (Wasatch County), and Snake Creek, 10 miles southwest of Heber, Wasatch County, Utah.

In Colorado considerable placer work has been done in the Four Mile District near Baggs, Wyoming, where three placer mines were producing in 1916. Near Lay, Moffat County, some work has been done, but at present only assessment work is being kept up. In the Hahns Peak District considerable activity has occurred from time to time with a good production. Placer mining and especially sluicing is being carried on in the district in addition to lode mining.

Other districts which have produced, or are producing at present, include the Perigo and Apex districts in Gilpin County, south of Rollinsville on the "Moffat Road," and the Harmon District, 12 miles east of Granby, Grand County, Colorado, as well as the La Plata District, 24 miles southeast of Granby, Grand County, Colorado.

GRAPHITE

The writer has seen samples of graphite from near Bingham, Utah, but does not know the exact location or size of the deposit, while the United States Geological Survey reports some so-called graphite from near Brigham, Utah, which might be used in the manufacture of paint or for foundry facings.

GYPSUM

About three-fourths of a mile southeast of Gypsum, Eagle County, Colorado, outcrops of gypsum occur on the west side of Gypsum Creek. This outcrop may be followed to the north and west as far as the Grand River. Other

outcrops occur 3 miles south of Gypsum and may be traced north and east along the south side of Eagle River and the Denver and Rio Grande tracks. Outcrops also occur north of the Eagle River and to the east of Gypsum.

These deposits are of very good quality and are quite large in places where two beds occur. They attain a maximum thickness of 180 to 200 feet; however this is a singular exception. In places large selenite crystals are scattered throughout the deposits, which are as a whole very good.

The deposits in the vicinity of Gypsum can be worked with little trouble, while those on the Grand River can only be developed through the building of a road between McCoy and Dotsero, such as it has been proposed the "Moffat Road" should build. A tramway might be built over the mountain and down to Eagle, but this would be prohibitive at present, although the deposit is extremely large and of very good grade.

Numerous deposits of gypsum occur in Utah in that territory adjacent to the proposed "Moffat Road" and served by the Denver & Rio Grande Railroad. The largest is an immense mass of rock gypsum located one mile east of Nephi, Juab County, Utah. This deposit is being worked, and has a mill for treatment of the gypsum on the ground.

In 1915 Utah was credited with a production of 23,445 tons, with a value of $75,835. Most of this gypsum was produced by the Nephi quarry.

Other large deposits occur on the west flank of the San Rafael Swell, Utah. These will become available as transportation facilities are increased in that district.

Gypsum is used in the making of a cement plaster and in the manufacture of plaster of paris by a calcining process.

IRON

Deposits of iron ore are known to occur in the vicinity of Douglas Mountain, Moffat County, Colorado, at Spring Creek, Uintah County, and Rhodes Plateau (Woodland), Wasatch County, Utah. All of these districts are tributary to the proposed "Moffat Road" but cannot be worked on account of the difficulties of transportation.

The ore in Uintah County is a brown manganese iron ore of limontic character, which, because of its distance from transportation, cannot be worked. It is most suitable for a flux, and on account of the size of the deposit could be developed for such purposes.

The iron deposits of Rhodes Plateau are much larger and the most promising of the three. The ore is a red hematite of two varieties, red ocherous and gray massive semispecular, and as a whole is of excellent quality. The deposit has never been thoroughly developed, but from the work already done the deposit would be of high commercial value. One pit 20 feet in diameter was entirely in ore, while another 30x40x15 was still in ore.

At present a haul of 35 miles to Park City, Utah, the nearest railroad point, makes the working of the property impossible, although some small shipments have been made to Park City.

The Douglas Mountain deposit has not been developed to any great extent, but seems to be a rather extensive deposit which is not being worked because of the haul of 90 miles to Craig, Colorado.

LEAD

Bingham and the West Mountain District, Utah, produced more lead than any other district in 1916. This district was closely followed by the Tintic, Park City, and the Ophir and Rush Valley Districts of Tooele County, with production as follows:

Bingham	85,996,490 lbs.
Tintic	39,294,351 lbs.
Park City	33,233,794 lbs.
Tooele County	18,275,389 lbs.

Other districts tributary to the "Moffat Road" and producing from time to time are the Provo and the Cottonwood Districts, the latter alone producing 15,061,273 pounds of lead in 1916.

Several districts in northwestern Colorado produce lead in combination with other minerals, but none of these could be classed as a strictly lead camp, the amount of that mineral being quite small.

MANGANESE

Manganese is found in the Little Grand District, 10 miles southwest of Little Grand, on the Denver and Rio Grande Railroad. The deposit has not been developed to any extent up to the present. Ores high in manganese occur in the Tintic District, but up to the past few years have not been mined as such.

MINERAL SPRINGS

The mineral springs at Glenwood Springs, Sulphur Springs, and Steamboat Springs, Colorado, are well known for their mineral and thermal properties, as well as for their medicinal and curative properties. These springs are visited by thousands of tourists every year, and the baths are open the year round.

Steamboat Springs is located 214 miles west of Denver on the "Moffat Road," while Sulphur Springs is but 109 miles west of Denver. Both places are ideal resorts except when cut off by snow blockades near Corona, on the Continental Divide, west of Denver.

Large springs of exceptionally good character are located at Juniper, Moffat County, Colorado, near the proposed line of the "Moffat Road."

Two springs are located, one east of Phippsburg, and the other southeast of Yampa, while a third is located west of Thersin, all in Routt County, Colorado. Another very good spring is located at Dotsero, the end of the proposed Dotsero cut-off.

These springs as resorts would, with improvements, be the equal of most of the foreign springs resorts, the main drawback now being their inaccessibility during some of the winter months.

MERCURY

Mercury is reported as being found in the ores of the Mercur District, Utah.

MOLYBDENUM

Molybdenum has been found at Slavonia and at Farewell Mountain, 5 miles east of Hahns Peak, Routt County, Colorado. Neither of these deposits has been developed and their possibilities are not known at present.

One claim on the Mount of the Holy Cross in Eagle County, Colorado, shows much promise under proper development.

A discovery of molybdenum in a peculiar form has been reported from near Ouray, Uintah County, Utah. This material is in the sandstone and gives the rock a bluish color. Assays, however, do not give a large molybdenum content, and the commercial value of the deposit is still in doubt.

Wulfenite, a lead molybdate, is found at Alta, Utah, as a gauge mineral in the silver lead deposits. It is not known whether this mineral has been discovered in commercial quantities.

Metallic molybdenum is used in the manufacture of tools and other special steel, and in the making of the wire for supporting the filament of certain incandescent lamps.

Amonium molybdate is used in the determination of phosphorus in iron; in fire proofing materials; as a disinfectant and germicide. Sodium molybdate is used as a coloring agent in pottery making and in silk and wool dying.

Molybdenum tannate is used in coloring leather. "Molybdenum Indigo," an oxide of molybdenum, is used in coloring rubber.

OIL AND GAS

The DeBeque Oil Field, situated just north of DeBeque, Mesa County, Colorado, has produced some oil, although drilling was not done on the axis of the structure proper, but off to one side. This field should not be condemned without properly drilling it out, and so still has some possibilities as far as future production is concerned.

The Rangeley Oil District is located in the extreme northwest corner of Rio Blanco County, Colorado. The oil field is located in a Government Petroleum withdrawal (Naval) of about 45,000 acres, and the wisdom of the withdrawal is evidenced by a number of capped wells. This district is very close to the proposed line of the "Moffat Road" and can only be developed through establishment of adequate transportation facilities.

Reports have been received from reliable sources that several wells have been "brought in" in the vicinity of Bonanza, Uintah County, Utah. This district is without any means of transportation except by auto to Watson, and a narrow-gauge road from there to Mack, Colorado, so will be extremely slow about developing, for as the manager said before the well was brought in: "If we get oil we won't know what to do with it out here. We will simply have to wait for a railroad."

The whole central portion of Emery County, Utah, has been set aside as a Naval Petroleum Withdrawal. No drilling is going on in this district at present and very little development work has been done in the district.

OIL SHALE

In Northwestern Colorado and Northeastern Utah, oil shale deposits underlie an area of approximately 7,000 square miles. In Colorado the areas are confined mainly to Moffat, Rio Blanco, Garfield and Mesa Counties, form-


MAP
SHOWING
MINERAL RESOURCES
OF
COUNTRY TRIBUTARY
TO THE
DENVER AND SALT LAKE R.R.
SOLID HYDROCABONS
GRAHAMITE
ASPHALT SANDS
CARNOTITE Vanadium Uranium
CLAYS
COPPER Predominates
GOLD Predominates
GRAPHITE
GYPSUM
IRON
LEAD Predominates
MANGANESE
MINERAL SPRINGS
MERCURY
MOLYBDENUM
OIL AND GAS
OIL SHALE
OZOKERITE
SALT
SILVER Predominates.
SLATE
SULPHUR
TUNGSTEN
Gold, Silver, Copper, Lead. (Predominate Mineral Uncertain)
ZINC
TOOELE
DAVIS
MORGAN
SALT LAKE
SUMMIT
WASATCH
UTAH
JUAB
MILLARD
SANPETE
SEVIER
EMERY
CARBON
DUCHESNE
UINTA
GRAND
MOFFAT
ROUTT
JACKSON
RIO BLANCO
GARFIELD
MESA
DELTA
PITKIN
GUNNISON
CHAFFEE
LAKE
PARK
EAGLE
SUMMIT
GRAND
BOULDER
ADAMS
CLEAR CREEK
JEFFERSON
DOUGLAS
TELLER
OIL SHALE
PETROLEUM WITHDRAWAL
GREAT SALT LAKE DESERT
SEVIER DESERT
SEVIER LAKE
COAL AREAS
SCALE: 1 INCH = 12 MILES

ing great irregular areas in the western halves of those counties. In Utah the deposits are found in the same irregular shaped areas in Uintah, Duchesne, Wasatch, Utah, San Pete, Carbon, Emery and Grand Counties.

This shale, a consolidated mud or clay, is "oil shale" in name only, because it does not contain a single bit of oil as such. It does, however, contain an infinite number of small organic remains, such as the remains of plants and animals, and these by a process of destructive distillation are converted into crude petroleum, and this crude petroleum by refining methods is in turn broken up into its various compounds such as gasoline, kerosene, lubricating oils and paraffin.

The United States at present produces about two-thirds of the world's supply of petroleum, but in spite of this fact the consumption today is in excess of the production and we are constantly making inroads on our petroleum reserves. As new discoveries are not being made fast enough to make up for these inroads on our reserves, we must look to a new source of supply, as the substitutes offered are not suitable for various reasons.

The future demands for petroleum will have to be met and can be met by production from our oil shale areas. It has been estimated by Dean B. Winchester of the United States Geological Survey, that in Colorado alone there is sufficient shale, in beds that are three feet or more thick, to yield about 20,000,000,000 barrels of crude oil, and that in addition, with but little more cost, there might be produced about 300,000,000 tons of ammonium sulphate, a very valuable and much desired fertilizer.

This industry, which will in time be developed along both the Denver and Rio Grande Railroad and the proposed "Moffat Road," will necessitate the investment of an extremely large amount of capital, and in order to properly establish the industry and market the various products refined, transportation facilities must be of the best. Long hauls over steep grades will increase rates and lower profits, and that district adjacent to the "Moffat Road" cannot hope to be developed without the completion of the proposed extension. It is reported that one company is at the present time contemplating the erection, in the immediate future, of an $800,000 plant, 65 miles from the main line of the Denver and Rio Grande Railroad, in a country really contiguous to the proposed route of the "Moffat Road." This plant from the start will be handicapped by the lack of transportation facilities, since it must ship its materials for construction, and its finished products as well, over a narrow-gauge line to the standard-gauge road of the Denver and Rio Grande Railroad.

Transportation will be an important factor in the development of this oil shale area, and any means of bettering the condition, rates, etc., will aid the industry at a time when it is starting and needs all the help it can get.

ONYX AND ONYX MARBLE

Just southeast of Steamboat Springs, Colorado, on the south side of the Yampa or Bear River, is rather a large deposit of onyx marble. This onyx marble, although somewhat limited in the size of blocks obtainable, is well adapted for numerous purposes. Some of this material has been shipped for use in ornamental work.

West of Fruita, Colorado, near the Colorado-Utah line, are certain areas of onyx. A considerable amount is available and can be cut and polished with very good results.

SALT

The salt industry has been developed quite extensively in the Salt Lake region, where a considerable tonnage is produced each year. This is shipped in all directions from Salt Lake and a large amount could easily find a market on the east side of the Rocky Mountains, and in that great cattle and sheep area along the proposed "Moffat Road."

SCORIA

A large amount of scoria is visible in cuts along Rock Creek near Volcano, Routt County, Colorado. This material has been used along the "Moffat Road" as far west as Steamboat Springs, and has proven to be a very good track ballast.

SILVER

During the year 1916 Juab County, Utah, including the Tintic District, produced the greatest amount of silver in the State of Utah. Juab County was followed closely by Salt Lake County and the Bingham District with the following production:

Juab County	4,892,439 ounces
Salt Lake County	3,863,264 ounces
Bingham District	2,095,335 ounces

Numerous other districts in Utah produced a predominance of silver over other metals, but the principal districts are the Park City, Alta, Silver Lake, Bingham and Tintic Districts.

In Colorado the principal silver producing districts tributary to the "Moffat Road" are located in Boulder county, although a number of districts such as at Blue Ridge and Parshall, both in Grand County, produce an ore of gold, silver, lead and zinc, in which it is hard to determine the predominant mineral.

SLATE

Deposits of slate have been developed in Provo Canyon, about 3 miles southeast of Provo, Utah. The material from the deposit finds ready market as a roofing material when used in combination with asphalt. Pieces about 12 by 16 inches are used in this way with very good results.

SULPHUR

A deposit of sulphur in San Rafael Canyon has been described by Frank L. Hess of the United States Geological Survey. This area lies about 20 miles west of Green River, Utah, along the San Rafael River, which cuts across the San Rafael Swell in Emery County, Utah. The deposit has had very little development work done on it, and its commercial value is not known at present.

TUNGSTEN

The well known Tungsten area of Boulder County, Colorado, lies to the north of the "Moffat Road" near Rollinsville. One good district lies immediately along the tracks just east of Rollinsville and is known as Camp Manchester. The main Tungsten area, however, lies about 4 miles north of Rollinsville, near Nederland, Boulder County, Colorado. For eastern shipment, where milling is not necessary, the best method would be to ship from Rollinsville over the "Moffat Road."

VOLCANIC ASH

Deposits of volcanic ash occur southeast of Kremmling in northwest Moffat County and in the Uintah Mountains. Part of this material is valuable as a base for scouring soaps and powders.

WATER POWER

Numerous power sites are available along the "Moffat Road" and adjacent country. One enormous power plant is now in operation at Shoshone, 9 miles above Glenwood Springs. This plant furnishes part of the power for Denver, over a power line 154 miles long, this line crossing both the Continental Divide and Argentine Pass, well above timber line.

ZINC

A workable deposit of zinc ore occurs in the vicinity of Blue Mountain in the southwest corner of Moffat County, and very close to the proposed course of the "Moffat Road."

CONCLUSION

From the variety, size and extent of the various mineral deposits in the country tributary to the "Moffat Road" it will be seen that the country is an extremely rich one, and that development will take place and be stimulated only as the transportation facilities are increased, there being practically no means of marketing the production of those districts at the present time.

In a like manner as facilities of transportation are increased and bettered along the Denver and Rio Grande Railroad, that district also will be stimulated in its development.

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